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VI.—THE VARIETIES OF THE OIL PALM IN WEST AFRICA.

(*Elaeis guineensis*, Jacq.)

Several accounts of the mode of preparation of the Palm oil in West Africa have appeared in the pages of the *Kew Bulletin*. The first of these, under the title of the Oil Palm in Labuan (*K.B.*, 1889, pp. 262–264), contains an interesting despatch from the Governor of the Gold Coast on the Palm oil industry in West Africa, dealing with the cultivation of the Palm and the manufacture of the oil. In the volume for 1891, pp. 190–192, a further account of the preparation of the oil on the Gold Coast is given with fuller details of the process. The Palm oil industry in Lagos is dealt with in the following year (*K.B.*, 1892, pp. 200–208), and illustrations of the Palm itself and of the method of preparation of the oil are given. There is also a short note on the Oil Palm in Sierra Leone (*K.B.*, 1893, p. 168).

In February of last year the attention of Kew was again called to the question of the West African Palm oil industry by the Secretary of State for the Colonies, who sent a copy of a letter from the West African Trade Association to the Director, in which the possibility of improving the cultivation of the West African Oil Palm is suggested. In the course of the letter reference is made to "a species of palm which bears soft-shelled kernels."

In his reply to the Secretary of State for the Colonies on the question of the need of further information on the Palm oil industry, the Director of Kew suggested that information should be supplied by the local authorities to show :—

"(*a*) To what extent the existing supplies of Oil Palm kernels are taken advantage of by traders ; (*b*) whether an Oil Palm with soft-shelled kernels is known on the West Coast of Africa, and if so, in what districts it is to be found ; (*c*) how far increased facilities of communication have tended to increase the quantity of palm oil reported during recent years ; (*d*) how far improved methods of extracting the oil have tended to improve the general quality of the oil produced ; (*e*) how far the higher quality of one known variety of Oil Palm compensates for the presumably smaller quantity of oil yielded by its kernels as compared with that yielded

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by other known varieties; (*f*) the relative abundance of the three known varieties; (*g*) the precise degree of moisture in the soil required to ensure a maximum yield of oil; (*h*) the extent of country in which this condition of moisture prevails; (*i*) the number of seasons during which an Oil Palm maintains a maximum yield."

In the following pages the answers to questions (*b*) and (*f*) only are considered and summarised. In a further note it is hoped to give extracts from the various reports which have been received in answer to the other questions put forward by the Director:—

With regard to the variety of the Palm bearing soft-shelled kernels, no specimens existed at Kew and the only allusions to such a variety, in British West Africa, before this time are to be found in an article contributed by Mr. A. E. Evans, Travelling Instructor of Agriculture, Gold Coast, to "Tropical Life," October 1907, p. 146, and in a "Note on the cultivation of the Oil Palm," by Dr. E. Drabble in the "Quarterly Journal" of the Institute of Commercial Research in the Tropics, Liverpool University, January 1908, p. 19.

The information in both cases, which is due to Mr. Evans, is to the effect that four well-marked forms of the Oil Palm can be distinguished in the Gold Coast, and of these No. 4, "Abobo-be" or "Yue Wyiam" is said to be the best variety on the Gold Coast. "The shell of the kernel is much thinner than that of the other varieties, and is so soft that it can be cracked with the teeth."

A further reference to the soft-shelled kernel is to be found in an article entitled "Notes on the Oil Palm of Southern Nigeria" by Mr. H. N. Thompson, Conservator of Forests, which was published as a supplement to the Southern Nigeria Government Gazette, No. 10, February 5th, 1908. According to Mr. Dawodu, assistant curator, to whom much of the information in these "Notes" is due, a variety of the Oil Palm "Ope-Arunfo" is known and is "distinguished by its fleshy small nuts and soft kernels," Mr. Thompson, however, was unacquainted with this form. Towards the end of the past year a good deal of information has been received from the several West African Colonies, in answer to the questions asked by the Director, as to the different varieties of the Oil Palm, and some specimens have been received at Kew which have thrown some light on the different forms.

Reports on the Oil Palm industry have been received from the Governors of Southern Nigeria, Northern Nigeria, the Gold Coast, Sierra Leone and the Gambia. Specimens have been sent to Kew from Southern Nigeria by the Provincial Forestry Officer, Benin City, Central Province, consisting of fairly complete botanical material of three varieties of the Oil Palm; by the Provincial Forestry Officer, Eastern Province, by direction of the Conservator of Forests, consisting of fruits only of four varieties. From the Gold Coast, Mr. A. E. Evans has sent two consignments containing fruits of most of the varieties of the Oil Palms referred to in his letter printed below.

Although the material which has been sent is not sufficiently complete to allow of final conclusions as to the botanical nature of

the different varieties, it has made it possible to co-ordinate the information on the subject from West Africa generally and to formulate certain suggestions.

The problems involved call for further careful work in the field, though it would no doubt be possible with complete material from different localities to arrive at some definite conclusions as to the botanical nature and the stability of the numerous forms, varieties and perhaps species of *Elaeis*.

It is partly in the hope that these questions may further engage the attention of those on the spot that the following account of the varieties of the Oil Palm has been drawn up :—

Southern Nigeria.

At the beginning of 1908, when attention was being drawn to the possibility of improving the cultivation of the Oil Palm, some useful 'Notes' were prepared by the Conservator of Forests (Mr. H. N. Thompson), at the request of the Commercial Intelligence Officer of Southern Nigeria. They deal more particularly with the cultivation of the Palm and preparation of the oil in Agege and Egba land, Western Province, where a good deal of attention has been paid by the more intelligent farmers to the subject. These districts were visited by Mr. Dawodu, assistant curator, and it seems probable that his visit may result in a more careful observation as to the best conditions for the growth and yield of the Palm.

Western Province.—The following information relating to the Oil Palm in the Western Province is extracted from the 'Notes' already referred to.

"In the Western Province, besides the ordinary typical species, two other varieties or sub-species are known.

"They are the Ope-Ifa and Ope-Arunfo of the Yorubas. The former is distinguished by the kernel of the nut having four or more 'eyes' (pores in the endocarp, opposite which the embryos are situated), instead of the three ordinarily found in the typical species. The pinnae (leaflets) of the leaves, moreover, are not split down to the mid-rib as is the case with the ordinary species, the basal third or so of the leaflets being adherent one to another. This peculiarity gives the leaves a massive, heavy character by which the variety can be at once distinguished from the others at a distance. The leaves are also usually of a darker shade of green.

"Branched individuals of the Ope-Ifa are sometimes met with (Mr. Dawodu).

"The oil prepared from the nuts of this variety is said to boil over with violence during the preparation.

"This variety is quite common in the vicinity of Lagos, and appears to favour the sandy country bordering the sea-shore and the lagoons.

"It gets scarcer as one proceeds up country into the hinterland.

"The Ope-Ifa is so well marked and established that I am inclined to look upon it as a true species. The Yorubas look upon it as a sacred tree, and the differences between it and the typical

species are sharply marked, and I have never yet come across individuals possessing characters intermediate to those of the two types.

"The second variety, the Ope-Arunfo, is distinguished by its 'fleshy small nuts and soft kernels' (Dawodu). I am not acquainted with this plant, and am unable to separate it from the ordinary typical species. According to Mr. Dawodu, the latter gives a better yield, both in nuts and oil, tree for tree, than either of the two above-mentioned varieties."

The thin-shelled variety has been found in the Agege and Abeokuta and Oshogebo districts.

Central Province.—From the same source, the following information—supplied by Dr. Unwin—is taken with regard to the three varieties of Oil Palm found in the Benin district, Central Province :—

"(*a.*) The Udin of the Benis. This is the commonest of the three, and is the typical plant. It bears, when mature, two to seven bunches of nuts ; the latter are of small size, but very numerous on each bunch.

"(*b.*) The sparsely distributed Ogedudin, or King Palm tree. It bears about the same number of bunches of nuts as the former, but the individual nuts are longer and contain a very small kernel. I have seen a specimen of this plant in Benin City, where it is looked upon as sacred, and find that it belongs to the same variety as that known to the Yorubas as the Ope-Ifa.

"(*c.*) The none too common Agonokwi, with small bunches of fruit containing from 20 to 40 nuts only. The latter are, however, very large, and the oil is only used for cooking purposes. It is said to spoil the commercial article when mixed with it."

The material of the leaves, male flowers, fruit and seeds of the three following varieties of the Oil Palm collected at Oka, Benin district, have been received at Kew from the Provincial Forestry Officer, Benin City :—

	Benin	*Yoruba*
(1.)	Ivioronmila	Ope-Arunfo
(2.)	Ogiedi, Ogedudin	Ope-Ifa
(3.)	Udin	

No. 2 is said to be distinguished from other varieties in having the pinnae joined together ; also it is not used for food purposes but only in medicine. According to Dr. Unwin this variety is the King Palm tree (Ogedudin or Ope-Ifa) ; in the Gold Coast this variety is known as Abe-Ohene, and it is considered that it may have been introduced from Southern Nigeria. It seems probable from the report of Mr. Hitchens (*see* p. 37) and from the material sent by the Conservator of Forests that this variety is the same as the Af-fia-ko-jub or Afia-okpo-Eyop of the Eastern Province.

No. 3. Udin according to other reports reproduced below, appears to be the Ope-Pamkora of the Yorubas (Ok-poruk-pu of the Ibos), and is the typical form of *Elaeis guineensis*.

Eastern Province.—With regard to this region information has been received through the Secretary of State for the Colonies from Sir W. Egerton, Governor of Southern Nigeria, and fruits and

seeds of the Oil Palm have been received at Kew from the Conservator of Forests. The thin-shelled variety is quite common and well known in this Province, and the yield of oil both from the pericarp and from the kernel is stated to be greater and of a better quality than that obtained from other varieties.

According to the report of Mr. C. Hitchens, Provincial Forestry Officer, Eastern Province, June 1908, three principal varieties of the Oil Palm may be recognized, all of which have native names though they have not yet been botanically differentiated. In the Ikot-Ekpene and Uyo districts the varieties are named as follows by the Efiks and Ibibios :—

(1.) A-sog-e-jub = Soft shell palm nut
(2.) Ak-por-ro-jub = Hard shell palm nut
(3.) Af-fia-ko-jub = White palm nut

By the Ibos, the most numerous and extensive oil-producers in the province, these varieties are known as :—

(1.) Au-su-ku (2.) Ok-po-ruk-pu (3.) O-ju-ku

From rough linear valuation surveys the distribution of the three kinds in the moist zone is assessed as follows :—

(1.) 30 per cent. (2.) 60 per cent. (3.) 10 per cent.

The following characteristics are given for these different varieties :—

No. 1. Very large cones studded with large, comparatively soft drupels ; exocarp deep purple almost black ; mesocarp abundant, full of oil ; endocarp comparatively soft, adherently enveloping a small, irregularly-shaped seed full of oil of a superior quality. No. 2 produces large cones studded with deep orange and purple drupels ; exocarp comparatively thick ; mesocarp less abundant and oily ; endocarp thick, hard, enveloping a large seed full of oil. No. 3 produces small cones of light, orange-coloured drupels ; exocarp thick and tough ; mesocarp very scanty, containing very little oil ; endocarp thick, hard, horny, enveloping a very large seed, sufficiently detached from the endocarp to rattle when dry.

In November, 1908, fruits and seeds of four varieties of *Elaeis guineensis* were sent to Kew by the direction of the Conservator of Forests with their various native names :—

	Efik.	*Ibo.*	*Ibibio.*
(1.)	Ösök Eyop	Osuku	Eduege Eyop
(2.)	Ökpörö Eyop	Okporokpo	Ikrök Eyop
(3.)	Afia Ökpö Eyop	Ojina	Efiako Eyop
(4.)	Mbana Eyop	Ekuebuba	Ayarambana Eyop

The three first-named varieties apparently correspond with those mentioned above, and the following particulars are given as to the fruits and seeds :—

" No. 1. This has a large fruit of a deep orange-claret colour becoming yellower at the base ; the fruits of this variety are longer than the others ; the pericarp is very rich in oil ; the best oil of all is obtained from this variety.

' No. 2. This has a large fruit, shorter and larger round than No. 1, of a red-yellow colour ; the fruit is the most angular of all the varieties ; it is very nearly as valued for its palm oil and kernels as No. 1.

"No. 3 has a large bright yellow fruit, with a very thin pericarp which contains little oil, covering a very large nut; the cobs of this variety are never cut down for palm oil, but are allowed to rot on the palm tree till the nuts fall to the ground, here they lie till all the fibrous fleshy pericarp has rotted off them; they are then collected and cracked for their kernels. The oil from this variety is light coloured, the fruits are used in native sacrificial ceremonies.

"No. 3 is never used for palm oil. This variety appears to be known in the Central Province and in the Gold Coast as the King Palm and to be the Ope-Ifa of the Yorubas.

"No. 4 has a light red-coloured fruit shading off to claret colour at the end; it is the smallest of all the varieties, but both palm oil and kernels are obtained from it."

In a further report from the Acting Conservator of Forests, dated August 10th, 1908, the names of the varieties are given as follows:—

	Ibo.	*Efik.*	*Yoruba.*	*Beni.*
(1.)	Au-su-ku	A-soge-e-jub	Ope-arunfo	
(2.)	Okporukpu	Akponojub	Ope-Pamkora	Udin
(3.)	Af-fiako-jub	Ojuku		

No. 2 is the typical form of *Elaeis guineensis* and is said to be by far the commonest in the Western and Central Provinces as the other two varieties together comprise a very small fraction of all the Oil Palms. The proportion of the thin-shelled variety, No. 1 Au-su-ku, in the Western Province is about 2 per cent. (Dawodu), and in the Central Province it is quite uncommon. In the Eastern Province this latter variety appears to exist in the proportion of 30 per cent. (Hitchens).

It is of interest to notice that the Governor of Southern Nigeria has issued instructions for the formation of a small Government plantation of this thin-shelled variety.

In connection with the experimental plantation which has been made in the Cameroons (*see* pp. 44, 45, and 47) the results from this plantation will be eagerly awaited.

Gold Coast.

The thin-shelled variety, as has already been pointed out, was first brought to the notice of Kew from the Gold Coast. On August 19th, 1908, Mr. A. E. Evans forwarded samples of three varieties of the Oil Palm to the Director of Kew with the following information, which is extracted from his letter:—

"By this mail I am sending you three small sample bags of palm nuts marked:—

I. Abobo-be, soft-shelled nut.
II. Abe-tuntum, hard nut.
III. Abe-pa, hard nut.

"The Abobo-be variety is exceedingly interesting, and appears to be widely distributed all over the Colony. From information I have been able to gather it does not appear to come true from seed, although the tree appears to yield the same nuts each year. It is impossible to distinguish one variety from the other without seeing the nuts."

Some additional information from the Gold Coast was received at Kew at the end of November, 1908, in a despatch from the Governor of the Gold Coast to the Secretary of State for the Colonies, transmitting an interim report on the Oil Palm, from the Acting Director of Agriculture (Mr. A. E. Evans) under the date of August 24th, 1908.

The two following paragraphs, relating to the different varieties of fruits to be met with, are extracted from this report :—

"There are undoubtedly six varieties of fruits of the oil palms in this Colony, but it is very doubtful if they are distinct species. In all probability the one known as Abe-Ohene and that known as Abobo-be will be found to be different species, but the remainder will, no doubt, be found to be variations from the true *Elaeis guineensis*.

"The form known as Abobo-be in this Colony somewhat resembles that described by Dr. Preuss in the Cameroons as Lisombe, but I am inclined to think it must be a different species, as the Abobo-be in this Colony is smaller than the other varieties, but has a much thicker fleshy pulp ; the Lisombe of the Cameroons is said to be a much larger fruit, and Dr. Preuss states that the average weight of the Lisombe fruit (arrived at from thirteen bunches) was 10·24 grammes, whereas the average weight of Abobo-be is only 6·25 grammes."

On the 25th January, 1909, a further despatch from Sir John Rodger to the Secretary of State for the Colonies was received at Kew through the courtesy of the Under-Secretary of State. The Governor in continuation of his former despatch enclosed a further report, dated December 3rd, 1908, from Mr. Evans, Travelling Instructor of Agriculture, the portion of which referring to the varieties of the Oil Palm is here reprinted.

"It is very difficult to give with any degree of accuracy the relative abundance of the known varieties of oil palms, so, for the purpose of this report, I have classed them under three groups :—

"1st group :—

Fruits large ; colour of pericarps varies from yellowish-white to blackish-red ; nuts hard.

1. Abe-pa.
2. Abe-dam.
3. Abe-tuntum.
4. Abe-fita or fufu.
5. Adi-be.
6. Abubu-be.

"2nd group :—

Fruits small ; very fleshy pericarps, with thin soft-shelled nut.

7. Abobo-be.

"3rd group :—

Fruits large ; pericarps brick red ; nut hard ; leaflets joined together at the base.

8. Abe-Ohene.

1st Group.

"1. Abe-pa. This variety appears to be the most abundant ; it is widely distributed all over the Colony. The fruits are pointed

at the apex, and contain a very hard thick nut; the pericarp is very thin, and of a dark reddish colour. The yield of oil worked out by native methods is 11·2 per cent.

"2. Abe-dam. 'The false or crazy oil palm'; shape similar to Abe-pa; pericarps yellowish-red; nuts very hard. Widely distributed over the Colony. Yield of oil 11·2 per cent.

"3. Abe-tuntum. Fruits nearly spherical; pericarps black at the apex and red at the base; nuts hard. It is widely distributed over the Colony, but not so abundant as the two former varieties. Yield of oil 13·7 per cent.

"4. Abe-fita or fufu. 'The white oil palm.' Fruits very large; pericarps reddish-white, and occasionally streaked with black; nuts hard. This variety is exceedingly scarce, only a few trees being known. The oil is of a yellowish colour, and quite distinct from the other varieties. Yield of oil 15 per cent.

"5. Adi-be. Fruits long, with small hard nuts. Pericarps very fleshy, brick red, black at apex. This variety is exceedingly scarce,. Yield of oil 28 per cent.*

"6. Abubu-be. Fruits resemble Abe-tuntum. Pericarps very fleshy; fibre in the pericarps very short, and, after being beaten, it looks as if it had been ground in a machine. This variety is very scarce, only a few trees being known. Yield of oil 25 per cent.*

2nd Group.

"7. Abobo-be. 'The soft-shelled oil palm.' Fruits medium size, similar in shape and colour to Abe-tuntum. Shells of the nut very thin, and can easily be cracked with the teeth. Not very abundant, but found in the Eastern and Central Provinces. It is undoubtedly the pick of the collection. Average yield of oil, 19·3 per cent. Two experiments 'A' and 'B' carried out with this variety are given below. In the former the oil was extracted by boiling, and in the latter the oil was extracted by ether—

	A.	B.
Oil	23·07 per cent.	25·60 per cent.
Fibrous waste	6·25 „	18·40 „
Shell and kernel ...	24·03 „	44·00 „
Loss during process ...	46·63 „	12·00 „
Total	99·98	100·00

3rd Group.

"8. Abe-Ohene. 'The king palm.' Fruits medium size; pericarps brick red, streaked with black, leaflets joined together at the base. Very graceful, tree exceedingly scarce; found at Piapiasa, a village some five miles from Aburi. Probably introduced from Southern Nigeria. Yield of oil, 15 per cent.

"I have not got statistics to give replies as to the quality of the various oils, but locally there is no distinction made, as the natives do not keep the oil produced by the various varieties separate. I

* *See* Anderson, J., Report upon Bot. and Agric. Dept., Gold Coast, for 1907, p. 20.

have forwarded to the Director of the Imperial Institute samples of the various oils ; and his report on them, as to their respective commercial values, will be of special interest."

Of the six forms included under Group 1, that named Abe-fita or fufu appears to be the most distinct. Both in the character of its oil and in the retention of the style and stigmas by the ripe fruit, this form may be easily distinguished from the others ; but whether these characters are combined with others which, taken together, may be of sufficient importance to raise this form to specific rank, cannot be known until adequate botanical material has been examined. The varieties Adi-be, Abubu-be and Abobo-be appear to be the most valuable.

Gambia and Sierra Leone.

The different varieties of the Oil Palm do not appear to be recognised by the natives either in the Gambia or in Sierra Leone. In the despatch of the Acting Governor of Sierra Leone to the Secretary of State for the Colonies, the following paragraph occurs—" The Agricultural Superintendent reports as follows . . . 'So far as I am aware, the oil palm as it occurs in this Colony cannot be divided into distinct varieties.' This statement is supported by Dr. Maxwell, the District Commissioner of the Railway District, who states that there may be differences in the thickness of the shell, but in no case has he seen what would be considered as a thin-shelled kernel."

Dahomey.

From the account by M. N. Savariau,* Chef du service d'Agriculture in Dahomey, the different varieties of the Oil Palm appear to be well known to the French, and specimens of well-marked, thin-shelled, and thick-shelled varieties were presented to Kew from the French West African section of the Franco-British Exhibition, by M. Max Robert.

" According to the natives of Dahomey," says M. Savariau, " certain palms give fruits with a soft shell (noyau) easily broken by the teeth. These fruits are used in their natural state, or are set apart to make an oil of excellent quality. The palms which produce them are not distinguished by any external character from the common palm."

Two other varieties are also recorded from Dahomey in the same work, viz.—" The common variety, with fruits the size of a pigeon's egg, with a hard shell," and " a well-recognised variety known as 'Palmier fétiche,' used for holy oil." This latter variety, of which an illustration is given, appears to be the " King Palm," or var. No. 3 of the Eastern Province lists.

Whilst this account of the Oil Palm in British Dominions was in the press the series of articles—not yet completed—on the Oil Palm in French West Africa, by M. J. Adam,† Inspector

* " L'Agriculture au Dahomey," N. Savariau, 1906, p. 64. Gouvernement Général de l'Afrique Occident, Française ; Colonie du Dahomey.

† Adam, J. Le Palmier à huile et le Cocotier en Afrique Occidentale Française in L'Agriculture pratique des pays chauds ; Bulletin Mensuel du Jardin Colonial, 1908, No. 68, pp. 380-389 ; No. 69, pp. 466-475 ; 1909, No. 70, pp. 35-46.

of Agriculture in French West Africa, came to our notice. They contain an admirable summary of the information which has been collected as to the varieties of the Oil Palm in the French possessions together with abstracts of papers on the Oil Palm in Togoland and the Cameroons (*see* below).

It is of interest to notice that M. Adam has treated the subject in a precisely similar manner to that which has been adopted in this article and that his conclusions are on the same lines as those here reached.

In Dahomey five varieties of *Elaeis guineensis* are recognised:—

(1.) Dégbakou ...	...	Thin shelled variety.
(2.) Fadé, Agoudé	...	(Palmier fétiche).
(3.) Dé (djè-djè)	...	The common variety.
(4.) Kissédé, Sédé	...	A variety with green tinted fruits.
(5.) Votchi ...	...	A variety without a definite shell.

The variety Fadé is the King Palm, the oil of which is only used for religious purposes ; it is distinguished from all others by the characters of the leaves (*see* below, also pp. 35, 36), of which an excellent picture is given. (Fig. 20, p. 496.) The other varieties can only be distinguished by their fruits ; in their leaves they are like the normal form of the Oil Palm.

The varieties Dégbakou and Votchi are of considerable interest, the former is the now well-known thin-shelled oil palm with a shell of about 1·5 mm. in thickness, but the latter appears to be a form unknown, or at least unrecorded, in British Dominions. In this variety the shell is said to have lost all resistance and to be reduced to a felt of fibres which yields to slight pressure. The kernel, if it exists, is very small and is often reduced to the mere embryo which is situated at the upper end of the fruit in the pulp. The felt of fibres represents the shell. This variety possesses the most abundant and most savoury pulp. Figures of the fruits of this variety and of Dégbakou are given by M. Adam on p. 468 (figs. 18, 19). The variety Votchi appears then to be a form of the thin-shelled variety in which the reduction of the shell has been carried to an extreme limit. It is affirmed by some of the natives of Dahomey that the different varieties of the Oil Palm, and especially the varieties Dégbakou and Votchi, do not come true from seed (*cf.* Evans, p. 38, Gruner, p. 43, Strunk, p. 45), many on the other hand declare that the different forms will reproduce true from seed.

In the varieties Dé and Kissédé the thickness of the shell is given as 4 mm. and 3·5 mm. respectively.

Three varieties of Oil Palm are also recorded from the Ivory Coast under the names Adé quoi, Aquoi sran, and Adé sran, the latter with a shell 1·5 mm. in thickness may be the thin-shelled variety. It is of interest to notice that a palm is recorded from the region of Bingerville which bears male flowers only—Adé sé—the stem remaining covered during life by the remains of the old leaf bases.

In Guinea and Senegal only one type of Oil Palm appears to occur.

Togoland.

According to the report of the Governor,* and from the paper by Dr. Gruner,† four varieties of the Oil Palm are known in Togoland.

They bear the following native names—

(1.) Dé-dé-bakui ... Dechla (Gruner).
(2.) Agadé ... ... Agodé or Klude (Gruner).
(3.) Dé ... ... Ede or Deti.
(4.) Dé dé ... ... Sedde.

No. 1 has thin shells which can be broken with the teeth and is said to require much moisture to grow in perfection; in a dry climate it approaches the common form. It is spread everywhere in the proportion of about 25 per cent. (Governor, Togo) and of 3–10 per cent. in the palm groves of Misahöhe (Gruner).

No. 2. This is the sacred palm. According to the Governor of Togo, it appears to be regularly cultivated and "Les féticheurs" cast lots with the nuts of this palm. Gruner states that the calyx segments are fleshy, red and contain oil. The leaves are easily recognised by their fused segments, but it is affirmed that these palms are never cultivated since only the common Deti is produced from the seeds of Klude.‡ To solve this question, Dr. Gruner states that he sowed 2,000 seeds of Klude at Misahohe in the spring of 1903, but the results do not yet appear to have been published.

No. 3 is the typical form of *Elaeis guineensis*.

No. 4 contains less oil than the typical form and does not appear to be a plant of great value.

Angola.

From Angola§ four varieties are reported :—

(*a.*) Varieties with a thin or cartilaginous shells and oblong fruits—
(1.) Disombé ... ... Thin shell cracked by teeth.
(2.) Digumbé ... Shell reduced to fibrous strands.
(*b.*) Varieties with a hard bony shell—
(1.) Dibohô ... ... Black epicarp becoming yellow-orange.
(2.) Dihûsué ... ... Epicarp retaining greenish tinge at the base.

Welwitsch in his "Apontamentos," p. 584, describes two varieties of the Oil Palm.—(1) A var. *macrosperma* (Dihôhó) from Icolo, and Bengo, Angola, which, from his description, appears to be a thick-shelled variety of the typical Oil Palm. The endocarp is 4–4·25 mm.

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* *See* Adam, J., l.c., 1908, p. 467.
† Dr. Gruner. Die Oelpalme im Bezirk Misahöhe, Togo, in *Der Tropenpflanzer*, VIII., 1904, pp. 283–291.
‡ Gruner, l.c., p. 284.
§ *See* Adam, J., l.c., 1908, p. 466, quoted from Almeida, J. J. Noticia sobre a Palmeira de Denden. Lisbon, 1906.

thick. (2) A variety with the native name of "Disombo," to which he gave the name var. *microsperma*, Welw., and the description "Palma spectabilis, monoica, oleifera et vinum optimum praebeus, idigena et freq. culta." His specimens in the British Museum have been examined, and are found to have thin shells of about 1 mm. in thickness, and to be very similar to the "Lisombe nuts" from the Cameroons, and the thin-shelled "nuts" from other localities.

Cameroons.

An account of the Oil Palm industry in the Cameroons was given in *Der Tropenpflanzer*, vi., 1902, pp. 450–476, by Dr. Preuss, in the course of which (p. 456) reference is made to a special variety of the Oil Palm known to the Bakwili as "Lisombe" or "Isombe." The fruits are like those of the ordinary Oil Palm, but differ in their thinner shell, which is the characteristic feature of the variety. The thickness of the shell is about that of the hazel-nut, and negroes crack them with their teeth. It is also stated that there appear to be two forms of Lisombe, according to the size of the fruit and kernel, but that they are not separated by the natives.

Of this variety only four plants are known at Victoria, but it is more frequent at Duala in Bassa Dörfen and in Bakoko.

In *Der Tropenflanzer*, 1906, p. 172, it is stated that 20,000 seeds of the Lisombe were distributed to stations and plantations from the Botanic Garden, Victoria.

From a few specimens of this variety in the Imperial Institute, it seems highly probable that the soft-shelled Lisombe is the same plant as the soft-shelled Oil Palm of British West Africa, Dahomey and Angola.

A more recent paper on the Oil Palm in the Cameroons by Dr. L. Strunk* supplements the information given by Dr. Preuss.

In his first "Table" particulars are given of eight varieties of the Oil Palm from the Cameroons which are compared with two from Togo taken from the account by Dr. Gurner. From the ratio of kernel to shell as shewn in this table, the most valuable varieties of Oil Palm can easily be seen.

The Lisombe and three other varieties with similar characters, Avelle, Mbié and Nségelén are considered to be the best.

One of the most important parts of this paper, however, deals with the question of the constancy of a given variety when grown from seed.

Lisombe seeds were sown at Victoria in the spring of 1902, from which 17 plants were raised, and seven of these up to the time of the publication of his paper (1906) had flowered and borne fruit, two of these had not yielded enough fruit for complete investigation but the shells when unripe were 2·5 mm. in thickness.

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* Strunk, Dr. L., "Zur Ölpalmenkultur," in *Der Tropenpflanzer*, x, 1906, pp. 637–642.

From Dr. Strunk's Table reproduced below it will be seen that only two of these plants (Nos. 1 and 5) shew the characters of the Lisombe Palm.

TABLE II.

No.	Fruit. g.	Fruit Flesh. g.	Seed. g.	Ratio of flesh to seed.	Kernel. g.	Shell. g.	Ratio of kernel to shell.
1 ...	7·48	5·86	1·62	3·61 : 1	0·60	1·02	0·59 : 1
2 ...	15·09	5·00	10·09	0·49 : 1	2·64	8·44	0·31 : 1
3 ...	9·76	3·72	6·04	0·61 : 1	1·60	5·24	0·31 : 1
4 ...	10·04	2·32	7·81	0·28 : 1	1·71	6·09	0·28 : 1
5 ...	9·04	6·16	2·88	2·14 : 1	1·04	1·84	0 56 : 1

It is suggested in the paper that in the course of time the inferior seedlings might approach the Lisombe in character and that the Lisombe may be a sport whose peculiarities are only transferred with delay to its offspring (*see* Note on var. No. 1, Togoland, p. 43).

This experiment appears to confirm the native reports referred to by Mr. Evans (p. 38), and M. Adam (p. 42) that the thin-shelled variety of the Oil Palm will not come true from seeds. The explanation put forward by Dr. Strunk does not however appear to be very convincing.

SUMMARY.

From the information from various sources, given in detail, it appears that at least three distinct and fairly definite forms of the Oil Palm are to be met with in West Africa :—

(1.) **The typical form** of *Elaeis guineensis* appears to be known under the following native names in Southern Nigeria: Udin (Beni), Ope-Pamkora (Yoruba), Ak-por-ro-jub, Okporo Eyop (Efik), Ok-po-ruk-pu, Okporokpo (Ibo), Ikrök Eyop (Ibibio). In the Gold Coast it seems likely that the forms known as Abe-pa and Abe-dam represent the typical Oil Palm, and that Abe-tuntum, Adi-be* and Abubu-be* should also probably be included. In Dahomey the varieties Dé, Kissédé ; Togoland, Dé, Ede or Deti ; Angola, Dihohô, Dihûsué all appear to represent the typical variety of *Elaeis guineensis* called by Welwitsch var. *macrosperma*. In the Flora of Tropical Africa, viii., p, 125, this variety is not maintained. The thickness of the endocarp in Abe-pa is from 3–4 mm. ; in Ökpörö Eyop 2–3 mm. ; in Abe-funtum or Abe-tuntum, 3 mm. ; in Kissede 3–5 mm. ; Dé and Dihôhó 4–4·25 mm.

The position of the White Oil Palm of the Gold Coast, Abe-fita, seems somewhat doubtful, and it seems possible that, owing to the character of its oil, &c., it may represent a distinct variety. The endocarp is from 2·25–3 mm. thick.

(2.) **The King Palm**, or Abe-Ohene of the Gold Coast, has already been referred to under Southern Nigeria, where it appears to have its home. In the Eastern Province it bears the names, Afia Okpö Eyop, Af-fiako-jub (Efik), Efiako Eyop (Ibibio), Ojina, Ojuku

* These two forms, however, shew a very high percentage of oil, *see* p. 40.

(Ibo). In the Central Province it is known as Ogedudin, Ogiedi (Beni), and it is the Ope-Ifa of the Yorubas. In Dahomey where it is known as "Palmier fétiche" it bears the native names Fadé or Agoudé and in Togoland it is known as Agadé, Agodé and Klude.

From the reports it seems likely that this plant will prove to be a distinct species, or at least, a well marked variety, but it is unfortunate that the specimen received at Kew does not show the characteristics which have been ascribed to it (*see* pp. 35, 42), so that at present no satisfactory conclusion can be reached. It is regarded as a sacred tree, and is used for medicine. The leaves with their fused segments appear to be a very distinctive character of this rare variety and this is well seen in the illustrations given by M. J. Adam. The trunk of the tree also seems to present a different appearance from that of the common variety.

The fruit and nuts of Efia Ekpo Eyop and Ogiedi or Ope-Ifa are figured (Figs. 8–11). In the former specimens the shells of the "nuts" are about 4·5 mm. in thickness, and in the latter from 4–5 mm. in thickness. In this respect they are very similar to the "nuts" of Welwitsch's var. *macrosperma*, from Angola, which bears the native name of Dihôhó. From his description, however, it seems that this form is probably a variety of the typical Oil Palm, and does not represent the King palm.

The Ope-Ifa, according to the report by the Conservator of Forests, Southern Nigeria, is distinguished by having "4 or more 'eyes' . . . . instead of the three ordinarily found in the typical species." Unfortunately, owing to the lack of material, it is not possible to estimate the value of this character. In the few nuts of the Ope-Ifa, sent from Benin city, the four pores in the endocarp are well seen (Fig. 11), but, on the other hand, specimens of Abe-tuntum, from the Gold Coast, have also been observed with four pores, and, judging from what obtains in other palms, the number of pores in the endocarp appears to be a character of very doubtful systematic value.

(3.) **The thin-shelled variety** of the Oil Palm has proved to be well known in the Gold Coast, Dahomey, Togoland, Southern Nigeria, the Cameroons and Angola.

From the evidence afforded by the character of the fruits and seeds, it appears then that the thin-shelled form of *Elaeis guineensis* is the var. *microsperma*, Welw. (Figs. 4 and 5).

In the Flora of Tropical Africa, viii, p. 125, this variety is upheld, and there seems sufficient evidence to justify the retention of the name var. *microsperma* for the thin-shelled variety of the Oil Palm. From the various reports it appears that the fruits afford the only means by which this variety can be distinguished. It is known by the following native names :—

Elaeis guineensis, Jacq. var. *microsperma*, Welw., Disombo (Angola) Lisombe, Isombe (Cameroons) Asoge jub, Ösök Eyop (Efik) (Fig. 6) Osuka, Ausuku (Ibo) Eduege Eyop (Ibibio) Ivioronmila (Benin) Ope Arunfo (Yoruba) Dé-de-bakui, Dechla (Togoland) Degbakou (Dahomey) Abobo-be (Gold Coast) (Figs. 1–3).

The variety Votchi from Dahomey, in which the shell is reduced to a felt of fibres, may possibly be the same as the Digumbé of Angola, and both these forms are probably variants of the thin-shelled variety.

The form sent from Old Calabar under the name Mbana Eyop differs somewhat from all the others in its smaller flask-shaped fruits. The endocarp is from 1·25–1·75 mm. in thickness.

The oils from the fruits of many of these various forms are under examination at the Imperial Institute, and further light may be shed on the subject as the result of their analyses.

Reproduction of the varieties of the Oil Palm from Seed:—It has already been noticed that Mr. Evans in his letter of August 19th, 1908, to the Director of Kew expresses a doubt as to whether the thin-shelled variety comes true from seed, and a similar doubt is expressed in M. Adam's account of the thin-shelled forms of Dahomey and in Dr. Gruner's account of the Klude variety of the Oil Palm in Togoland.

Dr. Strunk has also clearly shewn that in the small experimental plantation at Victoria, Cameroons, the Lisombe variety did not come true from seed. It cannot be held, however, that this experiment or the native reports disprove the stability of any given variety of the Oil Palm without further careful evidence.

The suggestion that seedling palms may only show the characters of their parents after some years of growth does not seem highly probable,* but it does appear likely, especially since the varieties grow intermingled, that cross fertilization may occur between the different forms.

The Victoria experiment is unfortunately on too small a scale to be of any great value, though the results, so far obtained, lend some colour to the suggestion that the seed used was of a hybrid nature.

From the foregoing facts it is clear that careful experimental work should be undertaken before any extensive sowings of the seed of a particular variety of the Oil Palm are made.

Experiments should be on the following lines and careful records should be kept.

(1.) Experimental plots of as many varieties as possible should be sown under the most favourable conditions and a sample of the seed sown in each case should be kept for future comparison.

(2.) Female inflorescences should be fertilized by male inflorescences from the same tree. This should be done with a few well marked varieties and with more than one individual of each variety. Care would have to be taken to prevent cross fertilization. The seeds produced should be sown in experimental plots.

(3.) Experimental plots might also be made on poor soil for comparison with those on good ground.

Observations and careful records are also required as to the character of the fruits borne by the same individuals of definite varieties over a period of years together with information as to the conditions of situation, moisture, &c. From such data it should be possible to discover whether any fluctuation occurs in the general characters of the fruit, in different seasons.

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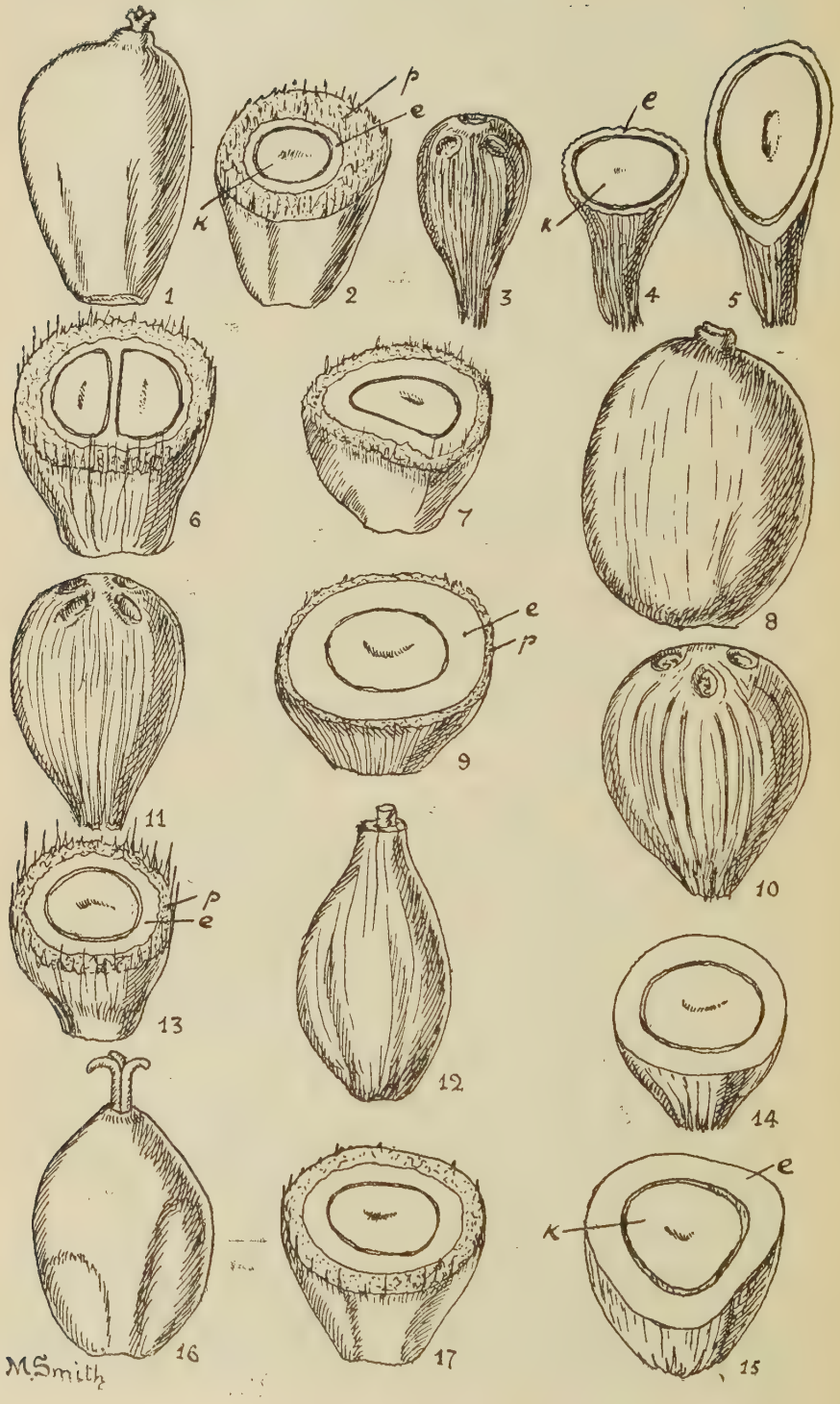
* The different characteristics of the three kinds of palm are in my opinion not accidental or due to variation of environment such as soil, situation, surrounding vegetation, rainfall or atmospheric humidity, because I have seen the three kinds growing in contiguity in very sandy loam under identically the same conditions, which clearly demonstrates that the differences are inherent not extrinsic. (Hitchens, Eastern Prov. S. Nigeria, *see* p. 37.)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M.Smith

Explanation of Figures.

All natural size.

Fig. 1. Abobo-be, (Gold Coast). The fruit.
„ 2. Abobo-be. The fruit in transverse section shewing the outer oily pericarp (p), the thin stony endocarp (e) about 1 mm. thick, and the kernel (k).
„ 3. Abobo-be. The "nut" shewing the 3 apical pores of the endocarp.
„ 4. Disombo, (Angola). *E. guineensis*, Jacq. var. *microsperma*, Welw.; the nut in transverse section shewing the thin endocarp and kernel.
„ 5. Disombo. The same in longitudinal section.
„ 6. Ösök Eyop, (Old Calabar). The fruit in transverse section showing twin kernels within the endocarp.
„ 7. Ökpörö Eyop, (Old Calabar). The fruit in transverse section; the stony endocarp is 2–3 mm. in thickness.
„ 8. Afia Ökpö Eyop, (Old Calabar). The whole fruit.
„ 9. Afia Ökpö Eyop. The same in section, shewing a thin outer pericarp and an endocarp about 4·5 mm. in thickness.
„ 10. The same, a nut shewing 3 apical pores.
„ 11. Ogiedi or Ope Ifa, (Benin). A nut shewing 4 apical pores said to be typical of this variety.
„ 12. Mbana Eyop, (Old Calabar). The whole fruit, which is flask-shaped and smaller than that of other varieties.
„ 13. Mbana Eyop. The fruit in section; the outer pericarp is thin and the endocarp measures from 1·25–1·75 mm. in diameter.
„ 14. Abe-funtum, (Gold Coast). The nut in transverse section; the endocarp is about 3 mm. thick.
„ 15. Abe-pa, (Gold Coast). The nut in transverse section; the endocarp is from 3–4 mm. in thickness.
„ 16. Abe-fufu or Abe-fita, (Gold Coast). The fruit shewing the style and stigma.
„ 17. Abe-fufu. The same in transverse section; the endocarp is from 2·25–3 mm. in thickness.

VII.—DIAGNOSES AFRICANAE: XXVII.

1001. **Sebaea pusilla**, *Eckl.*, var. **major**, *A. W. Hill.*

Caulis 8–12 cm. altus, superne ramosus. *Folia* elliptico-ovata vel linearia, acuta, 6–8 mm. longa, 2–3 mm. lata. *Flores* in cymas 1–3-floras dispositi. *Calyx* 4–5 mm. longus, segmentis lanceolatis carinatis. *Corollae* tubus 8–9 mm. longus; lobi 3 mm. longi, 1·25–2 mm. lati obovati, subacuti. *Filamenta* 2·5–3 mm. longa, sub apicem abrupte inflexa. *Stylus* 4 mm. longus, stigmate capitato.

Cape Colony. Clanwilliam Div.; banks of Oliphants river behind Clanwilliam, muddy soil, common, *Leipoldt*, 654! in Herb. Albany Mus. Grahamstown.

According to the collector's label the flowers are said to be blue. There is no other record of blue flowers in the genus, and it seems probable that there is some error in the label.

1002. **Exochaenium exiguum**, *A. W. Hill* [Gentianaceae-Exaceae]; species ex affinitate *E. chionanthi*, Schinz et *E. Baumiani*, Schinz sed forma parviore, foliis lineari-lanceolatis, antherisque praesertim differt.

Annua erecta. *Caulis* 6–8 cm. altus, simplex vel superne ramosus. *Folia* opposita, per paria 4–6, lineari-lanceolata, acuta 2–12 mm. longa. *Flores* solitarii longe pedunculati. *Calyx* 8 mm. longus, segmentis anguste ellipticis, acuminatis, anguste alatis. *Corollae* tubus 9 mm. longus; lobi 2·5 mm. longi, 1–1·25 mm. lati, obovati, acuminati. *Filamenta* 1 mm. longa, supra basin tubi 4 mm. inserta; antherae ·75 mm. longae, curvatae, liberae, 3-glandulosae, apice glandulis fusiformis ·5 mm. longis, basi glandulis minutis instructae. *Stylus* 2 mm. longus; stigmate 1·5–1·75 mm. longo clavato papilloso inter antheras disposito.

Rhodesia. Buluwayo, *Eyles and Johnson*, 1032! in Herb. Albany Mus. Grahamstown.

The roots in this plant are short and thick and are evidently provided with a mycorrhiza.

The species appears to be allied to *E. chionanthum* and *E. Baumianum*, in which however the lower leaves are ovate-oblong and the whole plant is much larger.

1003. **Salsola congesta**, *N. E. Brown* [Chenopodiaceae]; affinis *S. foetidae*, Del., sed habitu, cortice cinereo, nec albido, ramulis aphyllis subspinescentibus subhorizontaliter patentibus et ramulis foliiferis fasciculatis facile distinguitur.

Frutex lignosus, cortice cinereo. *Ramuli* aphylli, subspinescentes, subhorizontaliter patentes; ramuli foliiferi fasciculati, congesti, 0·5–3 cm. longi, minute tomentosi. *Folia* minuta, conferta, sessilia, imbricata, 1 mm. longa, late ovata, obtusa, crassa vel turgida, marginibus hyalinis submembranaceis, adpresse cano-pubescentia. *Flores* minuti, sessiles. *Sepala* 5, elliptica, obtusa, latissime hyalino-marginata, prope apicem plus minusve ciliata, in fructu alis membranaceis albis inaequalibus late cuneatis, apice subrotundatis suberosulis 1·5–1·75 mm. longis 1·5–2·5 mm. latis instructa.

British Somaliland. *Drake-Brockman*, 446, 447.

1004. **Salsola somalensis**, *N. E. Brown* [Chenopodiaceae]; affinis *S. Bottae*, Jaub. & Spach, sed ramis cortice cinereo, ramulis viridibus leviter corrugatis (nec atratis et laevibus) acutioribus, foliis minoribus et fructus alis pallidissime brunneis nec fuscis differt.

Frutex lignosus, ramosissimus, glaber. *Rami* cortice cinereo; ramuli patentes, recti, subaphylli, apice acuti vel subspinescentes, virides, longitudinaliter corrugati, 0·6–1·5 mm. crassi. *Folia* minuta, squamiformia, alterna, distantia, patentia, 0·5–1 mm. longa, ovata, acuta. *Flores* non vidi, bibracteati. *Bracteae* 1·25 mm. longae et latae, latissime ovatae, acutae vel obtusae, subscariosae. *Fructus* sessilis, orbiculatim alatus, 8–10 mm. diam., pallidissime brunneus; alae 5, membranaceae, imbricatae, latissime cuneatae, apice rotundatae, integrae.

British Somaliland. *Drake-Brockman*, 484.

1005. **Pycnocoma hirsuta**, *Prain* [Euphorbiaceae - Crotoneae]; species foliis subtus hirsutis, stigmatibus apice haud dilatatis, receptaculo carunculato insignis.

Frutex 2–4-metralis, ramulis ferrugineo-tomentosis. *Folia* brevissime petiolata, oblanceolata vel anguste oblonga, apice acuminata, margine argute serrata, basi longe attenuata, chartacea, supra glabra, subtus praesertim secus nervos pilis patentibus hirsuta; nervi secundarii 12–18-jugi; lamina 20–30 cm. longa, 5–8 cm. lata; petiolus 5 mm. longus. *Racemi* laterales in axillis summis tantum, 5–15 cm. longi; rhachis gracilis pubescens; bracteae patentes, ovatae, acutae. ♂ *Sepala* 4, reflexa, ovato-lanceolata, 5 mm. longa, extra hirsuta. *Stamina* indefinita, exserta; filamenta 6 mm. longa; receptaculum in carunculas inter stamina dispersas segregatum. *Ovarii rudimentum* 0. ♀ *Sepala* 5, anguste ovata, acuta, extra hirsuta, 4 mm. longa. *Ovarium* pubescens, 3-lobum, lobis exappendiculatis; styli triente inferiore connati, supra recurvi, stigmatibus linearibus haud dilatatis.

Tropical Africa. Nile Land; Uganda, Mabira Forest, *Dawe*, 202; *Ussher*, 62; *Bagshawe*.

As regards stigma this differs from the other continental African species and accords with the characters assigned to those which occur in the Mascarene Islands. It however differs from these latter in having a receptacle which is glabrous as in the continental species. The receptacle, however, in place of being a concrete body with pits in which the stamens are inserted is broken up into a congeries of caruncle-like bodies interspersed among the filaments.

1006. **Tragia** [Tagira] **Brouniana**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. cannabinae*, Linn. f., affinis, differt tamen statura humiliore, calycis foeminei segmentis lateralibus pluribus, angustioribus, foliorum segmentis angustioribus.

Herba perennis; caulis erectus simplex, setosus, 10–15 cm. altus. *Folia* breve petiolata, ad basin fere 3-partita, 5 cm. longa, segmentis lanceolatis inaequaliter dentatis; lobus centralis 8–9 mm. latus, laterales 1·25 cm. longi, 3–4 mm. lati; omnes firmuli, supra fere glabri; subtus pallidiores, pubescentes, setis paucis additis; petiolus 3–6 mm. longus, setosus; stipuli lanceolati, erecti. *Racemi* terminales, 2·5 cm. longi; bracteae anguste lanceolatae; rhachis dense setosa. *Flores masculi* pauci, breve pedicellati. *Sepala* 3. *Stamina* 3. *Ovarii rudimentum* minutum, 3-fidum. *Flores foeminei* basales. *Sepala* 6, pinnatifida, rhachi oblonga vel anguste oblonga; laciniae 3 terminales subaequales, ceteris lateralibus utrinque 6–7 dense ciliato-setosis longiores. *Ovarium* dense setosum. *Capsula* 3-cocca, setis rigidis albidis obsita, 6 mm. longa. *Semina* globosa, fusca, 3 mm. lata.

Tropical Africa. Nile land; Sennar; Sauleil, *A. F. & H. M. Broun*, 775.

1007. **Tragia** (Tagira) **gallabatensis**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. Hildebrandtii*, Muell.-Arg., habitu foliisque proxime accedens, differt tamen foliis alte tripartitis sepalisque floris foeminei multo latioribus.

Suffrutex, ramis erectis setis rigidis pungentibus parce indutis nec tamen pubescentibus. *Folia* breviter petiolata, alte palmatim

3-partita, membranacea, pallidiore viridia, setis perpaucis secus nervos medianos induta ceterum utrinque glaberrima ; lobi lanceolati, acuti, integri vel parce grosse-dentati, centralis 10–12 cm. longus, 1·5 cm. latus, laterales 6–8 cm. longi, ·75–1 cm. lati ; petioli 3–6 mm. longi ; stipulae parce setosae, lanceolatae, reflexae, 8–10 mm. longae. *Racemi* oppositifolii vel terminales, longe pedunculati, 10 cm. longi, parte florifera 4 cm. longa, pedunculo nudo setoso 6 cm. longo ; bracteae lanceolatae, parce setosae, 1-florae. *Flores* ♂ pedicellati, pedicellis parce setosis, 2 mm. longis. *Sepala* 3, ovata, acuminata. *Stamina* 3. *Ovarii rudimentum* 3-lobum, centrale, majusculum. *Flores* ♀ basales, saepius 2. *Sepala* 6, fructigera demum 9–12 mm. longa, alterna 3 parte centrali late oblanceolata 8 mm. lata, 3 parte centrali anguste oblonga 6 mm. lata, omina utrinque parce pubescens, margineque pinnatim laciniata, laciniis utrinque 6, lanceolatis, suberectis, extra dense setosis, intus glabris. *T. tripartita*, Schweinf. Pl. Gallab. Exsicc. n. 923 [nomen] nec Beille.

Tropical Africa. Nile land ; Gallabat ; Matamma, *Schweinfurth*, 923.

1008. **Tragia (Tagira) impedita**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. angolensi*, Muell.-Arg., quam maxime affinis, petiolis longioribus bracteisque florum masculorum brevioribus facilius distinguenda.

Caulis erectus, ramosus, 60 cm. altus, cortice pallido innovationibusque glabrescentibus. *Folia* manifeste petiolata, ovata, acuta, argute serrata, basi integro rotundata vel truncata, 4 cm. longa, 2 cm. lata, membranacea, supra glabra, subtus secus nervos parce hispida, ceterum glabra ; petioli puberuli et parce hispidi, 1·25 cm. longi ; stipulae late lanceolatae, erectae, 3 mm. longae. *Racemi* axillares, densi, breve pedunculati, 2·5 cm. longi, rhachide puberula ; bracteae ovato-lanceolatae, 2 mm. longae, puberulae ; pedicelli 4 mm. longi. *Sepala* floris masculi 3, ovata, acuta, puberula. *Stamina* 3. *Sepala* floris foeminei 6, 3 ambitu orbicularia, 3 alterna ambitu oblonga ; omnia pinnatim laciniata, laminae parte indivisa oblonga, laciniis 13–15 pubescentibus. *Ovarium* parce pubescens ; styli crassi, fere erecti, triente imo connati.

Tropical Africa. Mbuyuni, *Scott Elliot*, 6200.

1009. **Tragia (Tagira) Gardneri**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. subsessili*, Pax, affinis foliis minoribus ovatis nec subhastatis, bracteis saepissime obtusis, calycis foeminei lobis magis incisis capsulaque setosa differt.

Caulis erectus, ramosissimus, ramulis strictis subpatentibus, 40 cm. altus, parce pubescens pilisque rigidis urentibus plus minusve indutus. *Folia* subsessilia, ovata, acuta, basi truncata vel late cuneata ibique integra, margine basi excepto distincte serrata, 2–2·25 cm. longa, 1 cm. lata, pallide viridia, utrinque parce pubescentia subtusque secus nervos pilis rigidis obsita ; petiolus 1–2 mm. longus, stipulis ovato-lanceolatis, reflexis, 3–4 mm. longis. *Racemi* densi, terminales et oppositifolii, subspicati, 2·5 cm. longi ; pedunculi nudi ad 5 cm. usque longi, puberuli et densius pilis rigidis obsiti ; bracteae anguste ovatae, inferiores acutae, ceterae obtusae fere glabrae. *Flores masculi* breviter pedicellati. *Sepala* 3, ovata.

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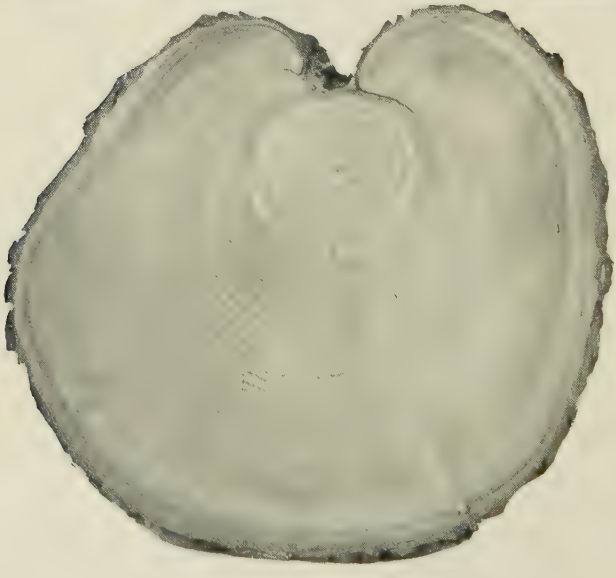

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Stamina 3–4 perfecta ; staminodia parva 2. *Flores foeminei* 1–2, basales. *Sepala* 3, pinnatipartita, setosa, ambitu orbicularia, demum 6 mm. longa lataque, laminae parte indivisa ovata, laciniis saepissime 13, lanceolatis, brevibus. *Ovarium* pilosum. *Capsula* setosa, 3-cocca, 6 mm. longa. *Semina* globosa, 4 mm. diametro, brunneo-rubra sed pallide marmorata.

Rhodesia. Gwelo, *Gardner*, 34.

1010. **Gladiolus subaphyllus**, *N.E. Br.* [Iridaceae] ; affinis *G. parvulo*, Schltr., sed elatior et subaphyllus cum floribus minoribus differt.

Cormus 1–1·2 cm. diam., tunicis fibrosis vestitus. *Planta juvenilis* unifoliata ; folium 9–12 cm. longum, 2·5–3 mm. latum, lineare, acutum, pilis patentibus laxe piloso-pubescens, marginibus incrassatis. *Planta florifera* subaphylla. *Caulis* 24–36 cm. altus, gracilis, glaber, apice 2–3-florus, vaginis duabus arcte investus cum vaginula 5–6 mm. longa arcte convoluta glabra infra inflorescentiam ; vagina inferior 2 3 cm. longa, oblique truncata, glabra ; vagina superior ad medium caulem attingens, 12–18 cm. longa, laxe patente pubescens, sulcato-striata, apice in acumen appressum subulatum vel lineari-attenuatum compressum acutum liberum 3–6 mm. longum producta. *Bracteae* aequales, 9–11 mm. longae, 4 mm. latae, oblongae vel elliptico-oblongae, subacutae. *Perianthium* infundibulare, 2–2·2 cm. longum, subregulare, album, carneo-tinctum ; tubus 5–6 mm. longus ; segmenta subaequalia, 15–16 mm. longa, 6 mm. lata, lanceolata, acuta. *Stamina* glabra.

Natal. Zwartkop, at 1,200–1,525 m., *Wood*, 10153.

VIII.—INJURIES TO PLANTS DUE TO HAIL AND FROST.

G. Massee.

The injury to foliage and flowers caused by hail is well known ; the fact that an equal, or perhaps greater amount of damage to the bark of trees is due to the same cause, is not so generally realised, the wounds formed being often attributed to frost, insects or fungi. Young trees, or the young branches of older trees suffer most, especially those kinds possessing a smooth bark. The injury caused is greatest during the early summer months, when the trees are in full growth, as at this time the bark is soft and most easily injured by bruising. The accompanying plate illustrates two portions of the branch of a pear tree that was injured by hail during the summer of 1908, and photographed the following January. Towards the lower end of the left hand figure (fig. 1). the injury caused by single hailstones is seen. The upper portion of the same figure illustrates the effect produced by several hailstones striking the branch at points near to each other. The right-hand figure (fig.2) shows the sheltered side of the same branch, which is free from wounds. The injury being confined to one and the same side of a branch, along with the more or less circular form of the isolated wounds, are factors characteristic of injury due to hail. When soft

bark is struck by a hailstone with moderate force, the bark is completely crushed and disorganised at the point of contact, and soon becomes dead and dry, contracting at the same time and breaking away from the surrounding living bark. Owing to this contraction, a fissure is formed separating the dead from the living portion, which too frequently enables the spores of different kinds of parasitic fungi to gain an entrance into the living portion of the branch, and complete its destruction.

It rarely happens in this country, that hailstones do a greater amount of damage to trees than indicated above, but in tropical countries where such storms are very severe, the amount of injury done must be immense. Under such conditions I have seen galvanized iron roofing perforated by hailstones as readily as if it had consisted of paper.

In speaking of the damage done to trees, Hartig says* :—"At places where the hailstones strike the rind is crushed, or it may be knocked off altogether. Although as a rule, a callus very soon forms over such wounds, still it not infrequently happens that the injured portion of the stem dies. In young spruce woods in the neighbourhood of Munich, I found that the leading shoots which were affected by hailstones died—a result doubtless due to the excessive evaporation from the wood, which in many cases was stripped of its cortex on one side of the shoot to the distance of about an inch."

Spring frosts.—These are, with much reason, dreaded by those concerned with the cultivation of plants. Many kinds of plants that survive without injury severe winter frosts, succumb to a comparatively slight frost after growth has commenced. This difference depends on the relative amount of water present in the tissues during different seasons of the year. When active growth commences the leaves and youngest shoots contain a considerable amount of water. During a late spring frost water is abstracted from the cells into the intercellular spaces, more especially under the epidermis of leaves and shoots, where it freezes into parallel prismatic crystals. The withdrawal of water from the cells of a leaf causes it to droop and exhibit the well known symptoms of the effect of frost. The recovery or death of a frozen leaf depends mainly on the precise manner in which thawing takes place. If the process is gradual, allowing the water to be reabsorbed by the cells as it thaws, little or no injury is sustained, whereas if the thaw is sudden, due to bright sunshine early in the day following a sharp frost, the rapidly liberated water floods the intercellular spaces, instead of being absorbed by the cells, and the death of the organ results. When actively growing leaves are frozen late in the spring, the epidermis of the under surface is often completely torn away from the remainder of the leaf, and hangs like a blister. Cabbages are often injured in this manner. The young leaves of evergreens also suffer in a similar way.

Frost cracks.—These are longitudinal cracks of variable length in the bark and wood of tree trunks, and are the result of a great and sudden lowering of the temperature. In this instance water is

Hartig and Somerville, "Diseases of Trees"; Engl. ed., p. 299 (1894).

withdrawn from the cell-walls, and freezes in the cavities of the cells. Owing to loss of water from the cell-walls, the cells shrink, and a crack is the result. When the temperature rises the cell-walls re-absorb the water, causing the cells to expand, and the crack closes more or less. The subsequent formation of callus completes the work of closing the wound. It not infrequently happens that an old frost crack, being a weak point, is reopened by succeeding frosts. As a rule little direct injury results from frost cracks, in the case of our native trees, but they often enable parasitic fungi to gain a foothold. When a frost-crack is completely healed, the callus formed from the two edges of the crack meets and forms a more or less projecting ridge, known as a frost-rib.

Sub-tropical trees often suffer severely from frost when grown in this country, even when not at first killed outright. *Catalpa bignonioides*, Walt., an ornamental tree, a native of the Southern United States is often injured by frost when growing in England or in the New England States. A very fine specimen at Kew, about sixty years old, recently succumbed from the cumulative effect of frost. The tree had two tiers of three more or less horizontal branches each. When the branches of the upper tier were about forty years old, each one was injured by a severe frost-crack throughout its entire length. These wounds never completely healed, as shown in the accompanying photograph (fig. 3), and afterwards no more shoots were produced on these branches, the result being a scarcity of leaves, which resulted in the crown of the tree being literally starved to death, owing to lack of food and water. The lower tier of branches, being sheltered by the upper ones, was perfectly healthy, and carried an abundance of foliage and flowers when the tree was cut down.

Something can be done to protect plants that have been caught by a spring frost. They should be protected by a covering of some kind—sheets, straw, &c.—from the sun's rays, so that they may thaw gently and gradually. When the covering method is impracticable, a thorough spraying with cold water is often effective in preventing rapid thawing.

In the case of frost-cracks or injury caused by hail, the wounded parts should be sprayed with Bordeaux mixture at intervals until a callus is formed.

IX.—LALANG GRASS.

(*Imperata arundinacea*, Cyrill).

J. M. Hillier.

Attention has recently been drawn to this plant as a source of paper-making material. It is a common plant in tropical countries and has been described as a pestilent weed, which once allowed to invade a plantation, can only be eradicated at enormous expense; it is ubiquitous, always one of the first weeds to cover newly opened land, and by far the most difficult to eradicate.

Imperata arundinacea proper has a creeping rootstock with solid stems of 1 to 3 ft. and glabrous or bearded nodes, leaves erect, often

exceeding the stem in length. Distribution : India, Malacca, Ceylon, &c. The variety *latifolia* found in the Tropical Himalaya from Kumaon to Assam is a more robust plant, with stems of 3 to 4 ft., glabrous nodes, and long leaves $\frac{1}{2}$ to $\frac{2}{3}$ inch broad.

Of the various methods adopted, or suggested, for the eradication of this grass the following note from the "Ceylon Observer" (1906) may be worth recording :—

"Lalang or Illuk grass, one of the worst of tropical weed pests, which was recently the subject of discussion at the meeting of the Board of Agriculture, is prevalent in Kedah. But a cheap and effective method for ridding the ground of it has been found. Lalang-grown land is let to Chinamen rent free, and a small sum of 10 to 20 rupees given to help the men to start. The Chinese cultivator is a wonderful worker and with the native wooden plough and buffaloes he turns up the soil and tramples under the roots, and then plants tapioca on the cleaned land. In the rows of tapioca, or, between them, the planter puts in his rubber seedlings, which the Chinaman looks after while he tends his tapioca crop, and keeps down the lalang tending to sprout. After the tapioca crop is taken the rubbers are growing up well and the land is perfectly clean. Another method of destroying lalang, we ("Ceylon Observer") were told by two planting visitors from Kedah, was by flooding the land. Water is turned on as if for paddy cultivation, and left on the surface for a couple of months until the lalang has rotted, when it is drained and the land ploughed for planting. Burning is also adopted, but to keep the fire under control, large ditches must be dug to prevent it spreading beyond bounds. Kedah is one of the native Siamese states in the Malay Peninsula".

The idea of turning this plant to a useful application is not a new one. In the early part of 1894 a correspondent at Singapore forwarded to Kew for report a sample of half-stuff prepared from it. This was submitted to Messrs. John Dickinson & Co., Ltd., Croxley Mills, Watford, who kindly furnished the following report under date March 27th, 1905 :—

"We have tried and tested the sample of lalang grass you sent us. The sample as received consisted of a block of dried fibre and not as the original plant. Further, the percentage of dry fibre obtained from the plant was not stated, so that we are unable to give the percentage of yield obtainable from the original grass. The dried and pressed pulp yielded about 75 per cent. of its weight of bleached fibre, and as a paper-making material seems to occupy an intermediate position between Spanish Esparto and good straw fibre. We estimate the value of this Singapore lalang grass, delivered f.o.b. London (in the dried brick form submitted to us), at about £5 10*s.* per ton. The dry uncrushed grass would be equally suitable if in well-pressed packed bales at a price proportionate to the fibre in it. We should be glad to try an experiment with it on a larger scale if we could get four or five tons of the grass."

Various other correspondents have communicated with Kew on the subject of the utilisation of this grass for paper-making, including Messrs. Ide & Christie, the well-known fibre experts, who

have kindly forwarded samples of the grass and a photo-micrograph of a transverse section of the leaf. (*See* Case 93, Museum No. II.)

The following account by Mr. G. Stewart Remington of recent chemical investigations and of experiments made in the manufacture of paper from lalang appeared in the Agricultural Bulletin of the Straits and Federated Malay States, December 1908, p. 585 :—

"One of our correspondents sent a sample of lalang grass recently to England, and has received the following report, also samples of paper made from lalang grass entirely and ½ lalang and ½ cotton :—

Certificate of Analysis.

"Sample of Lalang Grass marked 'Exchange Singapore, Straits Settlements,' on 23rd July, 1908.

"This is to certify that the above sample has been carefully examined with the following results :—

"This grass was forwarded to 'The Aynsome Technical Laboratories' for investigation, that its commercial use as a source of pulp for paper-making might be ascertained.

"The object of the present report is to draw attention to the importance and value of this grass as a pulp-producing material, and to indicate its chief characteristics and economic value.

"The sample was a pale buff colour, lustrous in appearance and of fair strength, of the order *Gramineae*.

"The chemical examination furnished the following results, the percentages other than that of moisture being expressed on the dry material :—

Moisture	13·21
Ash	4·14
Loss on L. Hydrolysis	10·76
Loss on B. Hydrolysis	46·65
Loss on Mercerisation	31·62
Loss on Acid Purification	0·95
Gain on Nitration	21·19
Cellulose	47·41
Length of ultimate fibre	1·20

"The ultimate fibre obtained from this grass is very similar in most respects to Esparto, the yield of bleached fibre being about the same. This is a favourable indication, inasmuch as 'Esparto' is one of the best known and most useful sources of supply to the trade. The fibres as seen under the microscope are short, smooth, cylindrical, fairly uniform in diameter, gradually tapering to rounded extremities ; they also occur together in little bundles. The pulp will be found to contain a number of small cuticular cells which do not however show in the finished paper. The fibres are stained a pale yellow with iodine solution, which fades more rapidly than is usual with coloured pulps.

"The results obtained from the chemical analysis show that the grass is capable of yielding a good quality of cellulose, suitable in every way for the manufacture of paper. Although the grass is very susceptible to the action of dilute alkalis, the final product is exceptionally pure and readily resolved.

"From observations noted during this preliminary examination the following scheme was adopted for the production of the pulp on a larger scale.

Process.

"The available grass in its natural condition weighing 400 grams. (14·1 oz.) was in a clean state, and required little treatment beyond cutting into small pieces ready for boiling. It is usually necessary on a large scale to pass the material through some type of cleaner to remove dirt and adventitious matter. The grass was then thoroughly wetted and soaked until it became soft and pliable. It was placed in a boiler of the spherical type, covered with water and digested with caustic soda corresponding to 15 per cent. on the grass treated for a period of 10 hours under a pressure which was kept constant at four atmospheres; an even temperature about 135° C. being maintained.

"Owing to the quantity of material at our disposal being somewhat limited, it was only possible to conduct one experiment, consequently a good margin in the use of caustic and degree of general treatment was allowed.

"The pulp obtained after washing was of good uniform quality and colour. The yield agreed very closely and was only slightly higher than the preliminary chemical analysis shewed, which indicates complete reaction in the digester.

"The pulp was carefully beaten for about an hour and at the same time bleached, chloride of lime being used for the purpose: 10 parts of dry powder being used per 100 parts of pulp.

"The stuff was taken from the beater and well washed and subsequently a small quantity of loading was gradually added and the whole again beaten for half-an-hour. At this stage of the operation the rosin size was introduced and the decomposition of the soda resinate completed with the calculated quantity of alum. The amount of size used corresponded to 4 per cent. on the dry pulp present, the total time occupied in preparation of the pulp for running on the machine being two hours.

Preparation of Paper.

"No great difficulty was experienced in running the pulp: it retained, however, a considerable quantity of water after passing the suction-boxes, and in consequence it was found necessary to keep the press roll down hard. On a large machine this precaution would not be necessary, as more suction-boxes are available and complete control is assured.

"The paper was passed over nine cylinders at a pressure of about 8 lbs. to the square inch, then through one calender and finally reeled off. In a similar manner a second sample was prepared, using a mixture of half pulp obtained from the lalang grass and half cotton beaten together. The paper obtained from this blend could prove very useful as a high-class wrapping paper, it being stronger and possessing a comparatively high resistance to folding, as will be seen in the following table of physical tests done on the

finished specimens of papers. The paper made from 'all-grass' pulp would, with judicious treatment for improvement of colour, be very suitable for printing purposes.

"The following table of figures was obtained and compiled from tests and analyses made on the air-dried finished papers—

	Pure Lalang.	*Half Lalang,* „ *Cotton.*	
Physical properties—			
Breaking strain (lbs.) ...	8·37	8·88	(way of machine)
Stretch (per cent.) ...	1·03	1·35	
Rubbing test ...	27	151	
Thickness (inches) ...	$\frac{1}{125}$	$\frac{1}{235}$	
Chemical constituents, per cent.—			
Rosin size	2·20	2·43	on the dry paper.
Ash (natural and loading)	3·01	1·94	on the dry paper.
Moisture	10·40	8·68	

"The addition of cotton to the pure lalang fibre has the effect of improving its resistance to crumbling, and also in a lesser degree its tensile strength."

X.—THE SOUTH AFRICAN BAMBOO.

(*Arundinaria tessellata*, Munro.)

Otto Stapf.

The existence of a bamboo in Cape Colony has been known for more than seventy years. It was discovered by Drège on several of the high mountains of the Colony as long ago as 1832, if not 1829. His collections include it from Table Mountain (Queenstown Division), Katberg (Stockenstrom Division), and the Witte Bergen (Aliwal North Division). On his labels he also records it from the Bamboesbergen (Tarka and Molteno Divisions), and other "very high localities on the boundaries of Caffraria." The altitudes given by him show a vertical range from 4,000 to 7,000 feet. According to him, it is very common in damp places in the Witte Bergen, where it grows to a height of 15 to 20 feet, whilst in the drier stations on Table Mountain and in the Bamboesbergen it varies from 5 to 10 feet. Almost simultaneously it was found by Ecklon on Winterberg, to the west of Katberg. Neither of the two collectors observed it in flower or fruit; but, from a certain similarity of the vegetative parts with *Nastus borbonicus*, Gmel., Nees, in his elaboration of the *Gramineae* of South Africa (1841), suggested that it was a *Nastus* and named it *Nastus tessellata*. In 1868, however, Munro in his monograph of the *Bambuseae*, transferred the plant to *Arundinaria* as *A. tessellata*. Although Cooper collected it again in the Maluti Range, Basutoland, in 1861, and, recently, Wood and Schlechter in the Drakensbergen, the flowers remained unknown and the generic position was therefore, to a certain degree, still hypothetical, when the bamboo was more fully described in the *Flora Capensis* in 1900. Last December, however, fine flowering

specimens of the bamboo were received at Kew from Mr. J. M. Wood, Director of the Botanic Garden at Durban, Natal. They had been communicated to him by Mrs. W. Putterill, and were collected on the Drakensbergen, near Harrismith, at an altitude of 5,000 to 7,000 feet.

The examination of the flowering specimens proved that Munro was right in referring the species to *Arundinaria*. A technical description of the inflorescences and flowers is given below, supplementing the description of the vegetative parts in the *Flora Capensis*. vii., p. 748. The species is quite distinct from the common tropical African *A. alpina*, K. Sch., and bears a certain resemblance to the Himalayan *A. spathiflora*, Munro, with which it has the spathaceous inflorescences and strongly tessellate leaves in common. The two-flowered spikelets, however, and also the nature of the glums distinguish it sufficiently. In fact it is impossible to point out any close and evident ally in the genus.

In the Kew Report for 1878, pp. 47, 48, there is a paragraph dealing with the economic value of this bamboo. In 1877, samples of the bamboo which according to Commandant J. H. Bowker "are found mostly on the northern slopes of the high mountain range dividing the east and west watershed of South Africa, and mostly on the most exposed sites" had been sent to Kew by the gentleman mentioned, and as a paragraph extracted from the "Natal Mercury" had gone the round of the English papers and caused enquiries concerning the bamboo, the samples received were submitted to a wholesale merchant dealing with such articles. The report was unfavourable, the conclusions arrived at being that the "South African canes, unless far superior to the samples sent, would have no place in the market in competition with the Chinese." Mr. Bowker himself, however, wrote:—"The bamboos are much used by the natives for spear handles, house-building, fences and gates to sheep-folds, &c. They can be got from 3 feet to 25 feet in length, and in any quantity. I have used a rod made from it for many years past and found it superior in spring and strength to any other I could get. I think they could be turned to account as coach-whip handles, umbrella handles, walking sticks, &c.; the root grows into almost every shape, and could be cut into handles of different patterns." From this it appears probable that the samples submitted to the expert were of inferior quality. Nothing more was heard about the use or usefulness of the bamboo; but it seems quite worth while to try again whether it could not be put to any practical use the more so as one of its principal stations, the one near the Van Reenen Pass in the Drakensbergen is now easily accessible by railway. At the same time an attempt should be made to take it into cultivation. It ought to prove hardy in this country.

The area of *Arundinaria tessellata* lies from Stockenstrom and Queenstown Divisions over Craddock, Tarka, Molteno, Aliwal North and Basutoland to the Drakensbergen, the easternmost station in that range being at the Van Reenens Pass. It may be pointed out in this connection that Munro in putting the lower limit of *Arundinaria tessellata* at 500 feet merely repeated a mistake or misprint in Nees's account of the bamboo, where it is said to occur on Katberg at 500 feet, instead of 5,000 feet. The

Bamboesbergen, referred to by Drège, are an extensive range of mountains along the boundaries of Molteno Division in the north and Craddock, Tarka and Queenstown Divisions in the south. There is another "Bamboesberg" to the west of Tarkastad and near the Tarka-Craddock boundary. It also has its name presumably from the occurrence of the same bamboo, in which case this mountain would mark the south-western limit of the area of *Arundinaria tessellata*.

Descriptio :—*Frutex* interdum arborescens, 1·5–6 m. altus ; culmi basi ultra 8 mm. diametro, fistulosi—uti rami foliati graciles approximati—teretes, laevissimi, ramorum internodiis raro 5 cm. excedentibus. *Vaginae* ad ramorum bases ortae, laminis destitutae, scariosae vel subscariosae, striatae, laeves, caeterae coriaceae, arctae, leviter striatae, praeter margines exteriores superne ciliatos et ora fugaciter fimbriata glabrae ; ligulae obtusae, plerumque breves, rarius ad 4 mm. productae ; laminae perfectae 3–4, versus ramulorum apices approximatae, lanceolatae vel linearilanceolatae e basi attenuata vel rotundata, breviter acutae vel longe in acumen tenuissimum productae, 6–12 cm. longae, 9–14 mm. latae, coriaceae, interdum subglaucae, ad basin parcissime pubescentes, ad margines spinuloso-ciliolatae (juniores quidem), caeterum glaberrimae, nervis lateralibus primariis utrinque 3 (rarius 4), ob venas transversas approximatas et distinctas plerumque eximie tenuiterque tessellatae. *Racemi* breves, circiter 4–5-spiculati in ramis florentibus undique ex axillis foliorum emortuorum ortis vaginis albido-stramineis emarcidis angustis superne longe attenuatis eos saepe paulo superantibus suffulti, cum vaginis foliorum annotinorum in amplam paniculam spuriam dispositi. *Spiculae* praeter imas interdum bractea racemum aequante suffultas ebracteatae, breviter pedicellatae, 16–18 mm. longae, 2-florae ; rhachilla producta, glabra, anthoecium imperfectum gerens. *Glumae* aequales, lanceolatae, acuminatae, 12–13 mm. longae, utrinque 5-nerves, venis transversis nonnullis. *Valvae* a latere visae suboblique lanceolatae, subacuminatae, 14–15 mm. longae, virescentes, nervis utrinque 4–5, venis transversis numerosis conspicuis. *Paleae* 11–13 mm. longae, carinis superne asperis, nervis extracarinalibus utrinque 2–3, venis transversis tenuissimis nonnullis. *Lodiculae* 3 obovato-ellipticae, ciliatae, 2 mm. longae, postica paulo minor. *Stamina* 3 ; antherae 8 mm. longae.

XI.—NEW ORCHIDS : DECADE 33.

321. **Octomeria arcuata**, *Rolfe* ; habitu *O. sarcophyllae*, Rodr., sed foliis latioribus sordide purpureis, floribus flavescentibus et labello trilobo purpureo-maculato differt.

Herba caespitosa, 8–13 cm. alta. *Caules* subgraciles, 3–5 cm. longi, vaginis membranaceis vestiti. *Folia* subsessilia, lanceolata, acuta vel acuminata, subrecurva, crassiuscula, canaliculata, 6–9 cm. longa, 1–1·5 cm. lata. *Flores* solitarii, subpenduli, 1 cm. longi. *Pedicelli* 5 mm. longi. *Sepala* et *petala* oblonga, obtusa, subincurva, 1 cm. longa. *Labellum* trilobum, 7 mm. longum, recurvum ;

lobi laterales erecti, late oblongi, obtusi, 2 mm. lati ; lobus intermedius late triangulari-ovatus, obtusus, recurvus ; discus bicarinatus. *Columna* incurva, 5 mm. longa.

Brazil.

Imported by Messrs. Sander & Sons, and flowered at Kew in November, 1908. The flowers are light yellow, with the keels and side lobes of the lip and the column dark red-purple. The leaves, on reaching maturity, assume a dull purple-brown colour on both surfaces.

322. **Oberonia umbraticola**, *Rolfe* ; ab *O. pachyrachi*, Reichb. f., spicis gracilioribus, floribus majoribus et labello sepalis lateralibus majore differt.

Herba acaulis, 5–6 cm. alta. *Folia* ensiformia, subacuta, 3–8 cm. longa, 8–13 mm. lata. *Scapi* foliis paullo longiores, ancipites ; spicae cylindricae, densiflorae, 3–5 cm. longae, 3–4 mm. latae. *Bracteae* late ovatae, obtusae, denticulatae, circa 0·5 mm. longae. *Flores* brevissime pedicellati, minuti, aurantiaci. *Sepala* ovata, subobtusa, circa 0·75 mm. longa ; posticum reflexum, planum ; lateralia patentia, concava. *Petala* lineari-oblonga, obtusa, reflexa, circa 0·75 mm. longa. *Labellum* integrum vel minutissime crenulatum, ellipticum, obtusum, concavum, 1 mm. longum. *Columna* brevissima.

Siam. Doi Govtep, in very shady jungle, at 1,200 m. alt., *Dr. Arthur Kerr*, 208.

Sent for determination from the Trinity College Botanic Garden, Dublin, by Dr. H. H. Dixon, in November, 1908. It is very near to the Himalayan *O. pachyrachis*, Reichb. f., and at first sight not easy to distinguish from it, but when the excessively minute flowers are boiled up and examined side by side, they present such differences as warrant their separation, for the Siamese plant has not only larger flowers, but a relatively much larger lip.

323. **Bulbophyllum (Cirrhopetalum) campanulatum**, *Rolfe* ; a *B. aurato*, Reichb. f., sepalis lateralibus brevioribus et connatis et petalis non falcato-aristatis differt.

Pseudobulbi subapproximati, ovoideo-oblongi, obscure tetragoni, 2–2·5 cm. longi, monophylli. *Folia* oblonga, obtusa, coriacea, concava (an semper ?), 8–9 cm. longa, circa 2 cm. lata, subtus purpurea. *Scapi* graciles, suberecti, circa 8 cm. longi, apice decurvi, circa 10-flori. *Flores* umbellati, radiati, recurvi, in inflorescentias subcampanulatas dispositi. *Bracteae* subulato-lanceolatae, recurvae, 4–5 mm. longae. *Pedicelli* 5 mm. longi. *Sepalum* posticum elliptico-ovatum, acuminatum, longe ciliatum, concavum, 6 mm. longum ; sepala lateralia connata, decurva, limbus oblongus, subacutus, convexus, apice subrecurvus, 1·5 cm. longus, 8 mm. latus. *Petala* ovata, subacuta vel apiculata, ciliata, 4–5 mm. longa. *Labellum* recurvum, carnosum, oblongum, subacutum, 3–4 mm. longum. *Columna* lata, 3 mm. longa ; stelidia obtusa vel truncata.

Sumatra.

Flowered at Kew in October, 1908, the plant having been sent from the Brussels Botanic Garden. It is a very elegant little plant, the strongly decurved united lateral sepals just meeting at their margins, giving the inflorescence a broadly campanulate shape, in allusion to which the name is given. The dorsal sepal and petals are

very pale whitish yellow, the former with five, the latter with three dull purple stripes, while the fringes are also dull purple. The lateral sepals are pale pink with innumerable darker dots, and the lip dull reddish purple. The flowers are smaller than in *B. auratum*, Reichb. f., and markedly different in shape.

324. **Eria (Eriura) solomonensis**, *Rolfe*; ab *E. Kingii*, F. Muell., pseudobulbis tetraphyllis, et labello integro distincta.

Pseudobulbus ovoideo-oblongus, erectus, circa 13 cm. altus, basi vaginis ovoidea-lanceolatis amplis vestitus, apice tetraphyllus. *Folia* elongato-lanceolata, acuta vel acuminata, basi attenuata, circa 9-nervia, subcoriacea, circa 30–35 cm. longa, 2–3 cm. lata. *Scapi* suberecti, graciles, circa 25–30 cm. longi, pubescentes; racemi multiflori, sublaxiflori. *Bracteae* oblongo-lanceolatae, acutae, parce pubescentes, 5 mm. longae. *Pedicelli* graciles, pubescentes, 1–1·3 cm. longi. *Flores* pubescentes, "albi." *Sepala* oblongo-lanceolata, acuta, 3-nervia, 8 mm. longa; lateralia paullo latiora; mentum conicum, obtusum, 4 mm. longum. *Petala* lanceolata, acuta, trinervia, 8 mm. longa. *Labellum* integrum, late oblongum, subobtusum, undulatum, tricarinatum, 7 mm. longum. *Columna* lata, 2 mm. longa.

Solomon Islands. *Charles M. Woodford*, 11.

Said to be a common species, but quite distinct from *E. Kingii*, F. Muell., the other Solomon Island species. It is allied to *E. profusa*, Lindl., a species of doubtful origin.

325. **Polystachya stricta**, *Rolfe*; affinis *P. Rivae*, Schweinf., sed inflorescentiis longe et stricte paniculatis, petalis et labelli lobis lateralibus angustioribus facile distinguenda.

Pseudobulbi caespitosi, oblongi vel subelongati, 4–8 cm. longi, diphylli. *Folia* oblonga, subobtusa, coriacea, 7–12 cm. longa, 1·5–2 cm. lata. *Panicula* erecta, stricta, 22 cm. longa; ramuli 2–2·5 cm. longi, puberuli. *Bracteae* triangulari-oblongae, acutae, 4–6 mm. longae. *Pedicelli* 4 mm. longi. *Sepalum* posticum oblongum, apiculatum, 8 mm. longum; sepala lateralia oblique triangularia, acuta, 1 cm. longa. *Petala* spathulato-lanceolata, apiculata, 8 mm. longa. *Labellum* 8 mm. longum, trilobum, curvatum, intus pubescens; lobi laterales erecti, late oblongi, obtusi; lobus intermedius ovatus, acutus, subrecurvus; callus tumidus, obtusus, infra medium disci situs. *Columna* lata, 2 mm. longa. *Mentum* latum, obtusum, 6 mm. longum.

British East Africa.

Flowered in the Cambridge Botanic Garden, in August, 1903, when it was sent to Kew for determination by Mr. R. I. Lynch. The flowers are light greenish yellow, with a few faint purple streaks on the base and side lobes of the lip.

326. **Cycnoches densiflorum**, *Rolfe*; a *C. Rossiano*, Rolfe, racemis masculis multo brevioribus et densifloris diversum.

Pseudobulbi erecti, teretes, circa 15 cm. longi, vaginis membranaceis vestiti. *Folia* oblongo-lanceolata, acuta vel acuminata, recurva, subundulata, circa 12–16 cm. longa, 3–4 cm. lata. *Flores* monoici. *Racemi* masculi penduli, multiflori, densiflori, circa 35 cm. longi. *Bracteae* lanceolatae, acuminatae, membranaceae, circa 1 cm. longae. *Pedicelli* graciles, circa 2 cm. longi. *Sepala* et *petala*

membranacea, oblongo-lanceolata, subacuta, recurva, viridia, purpureo-maculata, 2–2·5 cm. longa. *Labellum* unguiculatum, circa 1·5 cm. longum; lamina cochlearis, apice longe acuminata, margine digitis clavatis vel capitatis utrinque instructo. *Columna* gracilis, incurva, 2·5 cm. longa. *Racemi* feminei suberecti, breves, biflori, circa 5 cm. longi. *Bracteae* oblongo-lanceolatae, acutae, circa 1·7 cm. longae. *Pedicelli* crassi, arcuati, circa 4 cm. longi. *Sepala* et *petala* carnosula, patentia, oblonga, acuta, viridia, 3·5–4·5 cm. longa. *Labellum* breviter unguiculatum, ovatum, acutum, integrum, crassocarnosum, eburneum, 3 cm. longum, 2 cm. latum, basi callo transverso instructum. *Columna* crassa, clavata, incurva, circa 1·3 cm longa. *C. maculatum*, Gard. Chron., 1909, xlv. pp. 26, 27, fig. 19 non Lindl.

COLOMBIA. Simacota, near the River Opon, *J. Birchenall.*

A striking species from the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester. It was obtained from Messrs. Hugh Low & Co., in November, 1908, and they have since informed us that it was collected by Mr. J. Birchenall, in the district mentioned, among some species of *Mormodes*. An interesting fact about it is that both sexes appeared together on opposite sides of the same pseudobulb. The females are green with an ivory white lip, and the males, which are very diverse in structure, lighter green with brown spots. A figure has been prepared for the *Botanical Magazine.*

327. **Ornithidium bicolor**, *Rolfe* ; ab *O. coccineo*, Salisb., floribus aureis, labello macula sanguinea ornato distinctum.

Pseudobulbi caespitosi, ovoidei, subcompressi, 5–7·5 cm. longi, 3–5 cm. lati, basi diphylli, apice monophylli. *Folia* ligulata, arcuata, 15–30 cm. longa. *Caulis* floriferus elongatus, subcompressus, foliaceus ; folia patentia, oblonga, subobtusa, 7–10 cm. longa, circa 2·5 cm. lata, basi imbricata. *Flores* axillares, subfasciculati, pedicellati. *Bracteae* parvae, triangulari-lanceolatae, acutae, foliorum vaginis occultae, 5–10 mm. longae. *Pedicelli* circa 2·5 cm. longi. *Sepala* ovata, acuta, 8 cm. longa. *Petala* ovata, acuta, 6 mm. longa. *Labellum* trilobum, 6 mm. longum, basi erectum, non articulatum ; lobi laterales oblongi, obtusi, erecti ; lobus intermedius ovatus, apiculatus, recurvus. *Columna* oblonga, lata, 4 mm. longa.—*Ornithidium* sp., Rolfe in Orch. Rev. ix. p. 195.

COLOMBIA.

Introduced by Messrs. Linden, L'Horticulture Coloniale, Brussels, who flowered it in June, 1901, and presented it to the Kew collection. It is remarkable for producing two kinds of growth, the first with an ordinary pseudobulb, and the second a leafy flowering branch, which produces a succession of flowers from the leaf axils, as in *O. coccineum*, Salisb. The flowers are bright yellow, with a large crimson blotch on the front lobe of the lip.

328. **Stauropsis Quaifei**, *Rolfe ;* a *S. nagarensi*, Rolfe (*Sarcantho nagarensi*, Reichb. f.) floribus paullo majoribus et labelli lobo intermedio duplo longiore differt.

Caulis crassus, scandens ; internodi 3 cm. longi. *Folia* disticha, coriacea, oblonga, obtusa vel brevissime biloba, 20–22 cm. longa,

4–5 cm. lata. *Paniculae* axillares, circa 22 cm. longae, ramosae, densiflorae, basi vaginis ochreatis tectae. *Bracteae* reflexae, elliptico-oblongae, obtusae, 6–8 cm. longae. *Pedicelli* circa 1 cm. longi. *Sepala* patentia, obovato-oblonga, subobtusa, subconcava, 8 cm. longa. *Petala* patentia, obovata, obtusa, subconcava, 8 cm. longa. *Labellum* basi columnae affixum, continuum, trilobum, concavum, circa 7 cm. longum; lobi laterales erecti, late triangulares, subacuti, 4 mm. longi; lobus intermedius inflexus, lineari-oblongus, apice lateraliter complanatus et subobtusus, 6 mm. longus; discus carina elata et subtruncata instructus. *Columna* brevissima.

New Hebrides. Santo Peak, Espiritu Santo, at 1,370 m. alt., *W. T. Quaife*, 2.

Sarcanthus nagarensis, Reichb. f., was described from a very imperfect specimen, but the structure of the flower is that of *Stauropsis*, to which it must be referred. It is a native of Fiji, and has smaller flowers and a more fleshy texture than *S. Quaifei*.

329. **Phalaenopsis Wilsoni**, *Rolfe*; a speciebus omnibus adhuc notis radicibus aëreis longis fasciculatis, caule paucifoliato et brevifoliato facile distinguenda.

Herba epiphytica, habitu *Dendrophylaci* accedens. *Radices* copiosae, complanatae, verrucosae, 30–40 cm. longae. *Caulis* brevissimus. *Folia* non vidi. *Scapi* graciles, interdum parce ramosi, 15–20 cm. longi. *Bracteae* patentes, ovato-oblongae, conduplicatae, subacutae, 5–6 mm. longae. *Pedicelli* subgraciles, 2–3 cm. longi. *Sepalum* posticum ellipticum, obtusum, circa 1·8 cm. longum; sepala lateralia elliptico-oblonga, obtusa, 1·5 cm. longa. *Petala* elliptica, obtusa, 1·5 cm. longa. *Labellum* trilobum, unguiculatum, circa 1·5 cm. longum; lobi laterales erecti, oblongi, truncati, tridenticulati, 5 mm. longi; lobus intermedius obovato-oblongus, conduplicatus, truncatus, carinatus, laevis, circa 1 cm. longus. *Columna* clavata, 6–7 mm. longa; pollinarii stipites lati, complanati.

Western China. Cliffs at 1,200 m. alt. *Wilson*, 4576.

Mr. Wilson describes the sepals and petals as pink, suffused with purple, and the lip purplish crimson. The leaves, which are absent from the Kew specimen, he describes as few and small. It has no very near ally.

330. **Sobralia valida**, *Rolfe*; a *S. Lindleyana*, Reichb. f., foliis multo majoribus, labello tricarinato et non maculato differt.

Caules robusti, glabri, 20–25 cm. alti, 3–4-phylli, basi vaginis tubulosis 2 obtecti. *Folia* late elliptica, subacuta, subplicata, glabra, subcoriacea, 12–20 cm. longa, 6–8·5 cm. lata, amplexicaulia; vaginae tubulosae, subcompressae, ancipites, 3–5 cm. longae. *Spatha* abbreviata, subfoliacea, apice subacuta et patens. *Bracteae* parvae. *Flores* pauci, heterochronici, ochroleuci, fragrantes. *Pedicelli* breves, subinclusi. *Sepala* subconniventia, lanceolato-oblonga, acuta, concava, ecarinata, 4·5–5 cm. longa. *Petala* lanceolato-oblonga, acuta, sepalis aequalia, vix concava. *Labellum* integrum, oblongum, obtusum, minute crenulatum, concavum, circa 4 cm. longum; discus tricarinatus, venis fronte pilosis. *Columna* clavata, 2 cm. longa; dentes lineari-oblongi, incurvi, 4 mm. longi.

Panama, near the Darien Gold Mines.

Received from Messrs. Sander & Sons, St. Albans, and flowered at Kew in June, 1907. It belongs to a small group having an arrested inflorescence, glabrous leaf-sheaths, and a lip with crested veins, of which only five species were previously known. The flowers are whitish yellow, with a deeper yellow band on the lip, becoming deep orange in front. It was obtained by Dr. Hodgkinson, The Grange, Wilmslow, with a few other orchids, from the locality above named.

XII.—THE SECTION MICROCOS OF GREWIA IN AFRICA.

T. A. Sprague.

The genus *Grewia*, which includes at least 150* species, is confined entirely to the old world. It is very richly developed in both the African and Indo-Malayan regions, but is represented by comparatively few species in Australia and Polynesia.

Since the publication in 1868 of the first volume of the *Flora of Tropical Africa* the number of species known from Tropical Africa has been more than doubled, and it had become increasingly difficult, in the absence of any revision, to determine the new African material correctly without undue expenditure of time. On this account, a rearrangement of the Tropical African material was undertaken by the writer in conjunction with Mr. J. R. Drummond, who assumed responsibility for rather more than half of the species. A revision of the African species belonging to the section *Omphacarpus* has already appeared (*K.B.* 1909, p. 18).

Microcos was founded on "Microcos foliis alternis oblongis" Burm. Thes Zeyl. p. 159, t. 74 (1737), and was at first treated by Linnaeus as a distinct genus, but was afterwards reduced by him to *Grewia* in the twelfth edition of the Systema, 1767, p. 602.

In 1834, Wight and Arnott made it a section of *Grewia*, relying on the 3-celled ovary and terminal inflorescence to distinguish it from *Eu-Grewia* (Prodr. vol. i. p. 81). The more recent history of the section runs parallel with that of *Omphacarpus*, the principal contributions to our knowledge being those by Masters in the Floras of Tropical Africa and British India. In the former he described a new Angolan species, *G. floribunda*, which was then the only known African representative of the section, and possessed a fibrous mesocarp. In the latter he distinguished three sections as follows:—1, *Eu-Grewia*, inflorescence usually axillary, fruit fleshy or crustaceous usually lobed; 2, *Omphacarpus*, inflorescence terminal, flowers involucrate, fruit with a corky or fibrous rind [not lobed]; 3, *Microcos*, inflorescence terminal, flowers involucrate, fruit entire, fleshy.

Thus the only character given by Masters to distinguish *Omphacarpus* from *Microcos* was the corky or fibrous, not fleshy, mesocarp. But he himself had previously correctly described *G. floribunda* as

* 60, according to the Genera Plantarum (1862); 90 or less, according to Pflanzenfamilien (1890).

having a fibrous mesocarp; and this is also characteristic of the Asiatic species, *G. Microcos** and *G. paniculata*†, both of which belong to section *Microcos*. Hence it would appear that there is little beside the habit and the larger fruit to distinguish *Omphacarpus* from *Microcos*. It seems desirable, however, pending a revision of the entire genus, to follow King‡ in keeping the two sections separate. The African species of *Microcos* may be distinguished as follows:—

Bracteae 5–6 mm. longae; ovarii loculi 4–6-ovulati.
Folia exsiccando viridula, utrinque glabra nervis subtus puberulis exceptis ... ... 1. *floribunda*.
Folia exsiccando brunnea, supra stellatim puberula, subtus subtiliter pubescentia ... ... 2. *salamensis*.
Bracteae 2–3·5 mm. longae; ovarii loculi 2–ovulati 3. *Sereti*.

1. **Grewia floribunda**, Mast. in Fl. Trop. Afr. vol. i. 1868, p. 252; Hiern, Cat. Afr. Pl. Welw. vol. i. 1896, p. 97.

Angola. Mountains of Zengas de Queta and Capopa, Golungo Alto, *Welwitsch*, 1385! Near Luxillo, Pungo Andongo, *Welwitsch*, 1386! Bembe, Congo, *Monteiro!* Congo Free State. Banana, *Monteiro!* below Stanley Pool, *H. H. Johnston!*

Var. **latifolia**, De Wild. in Ann. Mus. Congo, sér 5, vol. i. 1904, p. 164; vol. ii. pp. 46, 298.

Congo Free State. Boma, *L. Pynaert*, 17; Moanda, *J. Gillet*, 3199, 4041.

G. floribunda is evidently very closely allied to the Asiatic species *G. Microcos*, L., which is known from China, India and the Malay Archipelago. Hiern's remark that it is "apparently the same species as *G. africana*, Mast." is puzzling, as there appears to be no very great resemblance between it and either of the specimens referred by Masters to *africana*.

The leaves of the type specimens (Welwitsch's) are conspicuously serrate, those of Monteiro's specimens finely serrate, and those of Johnston's very finely serrulate or denticulate. In the Welwitsch and Monteiro specimens I found, as in *G. Microcos* (see Pierre, Fl. Forest. Cochinch. t. 152) a 3–4-celled ovary with 4 ovules in each cell, whilst in Johnston's specimen the flowers examined had a 3-celled ovary with 4–6 ovules in each cell.

Var. *latifolia* seems, from the description, to differ but little from the type, the supposed difference in size of the leaves being non-existent, for Welwitsch's No. 1385 and Monteiro's Banana specimen have leaves which exceed the dimensions given for var. *latifolia*. The leaves of the type, however, are practically glabrous on the upper surface, while those of the variety are said to have scattered stellate hairs.

2. **G. salamensis**, *Sprague*, sp. nov.

Ramuli brunneoli, pubescentes, demum cinerei, glabrati. *Folia* obovato-oblonga vel obovata, basi inaequaliter rotundata, apice breviter obtusiuscule acuminata, 5·5 12 cm. longa, 3 4·7 cm. lata, supra brunnea, stellato-puberula, subtus sordide fulva, subtiliter stellato-pubescentia; nervi laterales utrinque 3–4 praeter basales;

* Cooke, Fl. Bombay, vol. i. p. 145.
† King, Materials, vol. i. p. 220.

petioli 7–10 mm. longi, fulvo-tomentelli ; stipulae caducae. *Paniculae* vix adultae circiter 7 cm. longae ; rhachis fulvo-furfuraceo-tomentella ramis patulis. *Pedicelli* circiter 2·5 mm. longi. *Bracteae* circiter 6 mm. longae, trifidae, utrinque pubescentes. *Sepala* spathulato-cucullata, 8–9 mm. longa, utrinque stellato-pubescentia. *Petala* 3·2–3·5 mm. longa, parte inferiore late obovata circiter 1·3 mm. longa et fere aequilata glandulam ellipticam 0·8 mm. latam intus gerente extus tomentella, parte superiore circiter 2 mm. longa oblonga, breviter bifida, puberula. *Gonophorum* glabrum, 1 mm. longum, medio leviter constrictum, angulatum, apice dense pubescens, 5-cuspidatum cuspidibus deltoideis patentibus 0·3 mm. longis. *Stamina* circiter 40, 4–6 mm. longa, inferne 0·5–1·75 mm. stellato-pubescentia. *Ovarium* ovoideum, tomentellum, 1·5 mm. longum, 3-loculare loculis 4–6-ovulatis ; stylus 4·5 mm. longus, inferne puberulus. *Fructus* ignotus.

German East Africa. Dar-es-Salam, *Kirk !*

3. G. Sereti, De Wild. in Ann. Mus. Congo, sér. 5, vol. ii. 1908, p. 299.

Congo Free State. Monbuttu land, near Gumbari, *F. Seret*, 814!

Var **rotundata**, *Sprague*, var. nov. ; foliis basi rotundatis nec manifeste cordatis, nervis basilaribus utrinque solitariis a typo recedit.

Congo Free State. Monbuttu land, *Schweinfurth*, 3599! Uganda. Bugoma Forest, Unyoro, *Bagshawe*, 1388!

Kew is indebted to Dr. E. De Wildeman for a small portion of the type specimen of *G. Sereti*. The ovary in both type and variety is 3-celled with 2 ovules in each cell.

XIII.—MISCELLANEOUS NOTES.

Mr. Alexander Hardie, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Sir George King.—By the death at San Remo, on 12th February, 1909, of Sir George King, K.C.I.E., F.R.S. LL.D., Kew has been deprived of an old and tried friend. He was born in Aberdeenshire on 12th April, 1840, and was educated at the Grammar School of that city. He subsequently entered the University, where he studied medicine and graduated as M.B. in 1865 with highest academical honours.

As an undergraduate his abilities and scientific tastes had commended him highly to Professor G. Dickie, F.R.S., the well-known algologist, who then occupied the botanical chair at Aberdeen. King acted for a time as assistant to Professor Dickie and, as was natural in a favourite student of such a teacher, developed a strong inclination towards the study of botanical problems

connected with cytogamic plants. Acting on the advice of Sir William Hooker, then Director of Kew, which was strongly supported by Dr. Dickie, it was King's intention to follow the example of Dr. (now Sir) Joseph Hooker and enter the Naval Medical Service. Before the close of his academical career, however, the Government of India, who since 1860 had ceased to grant commissions in the Indian Medical Service, once more opened the ranks of that service to young medical men. Influenced by the advice of Professor Harvey, the talented occupant of the chair of Materia Medica, who shared Dickie's estimate of his abilities, King decided to forego his earlier intention and entered the Indian Medical Service on 2nd October, 1865. At the close of the preliminary course of study at Netley, prescribed for young military medical officers, King was posted to the Bengal Presidency. It is of interest to note that he was entrusted by the Director of Kew with the care of the first Ipecacuanha plant to reach India ; this he delivered in safety to the Superintendent of the Royal Botanic Garden, at Calcutta, on reaching that port in March, 1866.

His Indian service commenced at the General Hospital, Calcutta, but he was shortly afterwards transferred, as house Surgeon, to the Medical College Hospital and after some time was posted to military medical service in Central India and Rajputana, where at Goona, Ajmir and Mount Abu, he devoted his leisure to excellent work as a field-naturalist. From this military duty he was deputed, in December, 1868, to act temporarily as superintendent of the Botanic Garden at Saharanpur in the North-west (now the United) Provinces ; after this duty was over he was induced to enter the Indian Forest Service under the same Government, when he was put in charge of a forest circle, the headquarters of which were at Dehra Dun.

While thus employed he was, in 1871, selected by the Secretary of State for India as successor to Dr. Thomas Anderson, whose untimely death in October, 1870, had rendered vacant the Superintendentship of the Royal Botanic Gardens, Calcutta, and of Cinchona Cultivation in Bengal as well as the Professorship of Botany at the Medical College, Calcutta.

The task King had to face was a heavy one. Two cyclones of extraordinary severity in 1864 and again in 1867 had reduced every public and private garden in and around Calcutta to a miserably dilapidated state. The Botanic Gardens both as a scientific centre and as a place of public resort had practically to be renovated, and the work involved afforded ample scope for King's powers of organisation. The Cinchona plantations in British Sikkim, established by Dr. Anderson, whose life was practically sacrificed to the zeal with which he performed this duty, had reached the critical stage at which it was necessary to determine whether the extraction of the alkaloids of Cinchona bark on a commercial scale was an economic possibility. Funds were required to the perfecting of King's designs in both directions. That these were readily available gives ample proof both of the enlightened liberality of the Government of Bengal and of the confidence which King's administrative gifts inspired in the officials under whom he served. In the course of his operations

the aspect of the garden was entirely changed. Originally a portion of the rice swamp which constitutes the greater part of the Gangetic delta, King excavated a series of lakes and ponds, the soil taken from which enabled him to raise the general surface level of much of the area, so that many species which previously could not be made to thrive were now capable of being successfully cultivated. He added to the establishment green-houses, a splendid palm-house and an excellent herbarium building. The charm and beauty of the lakes and groves, the avenues and lawns for which the garden is now so justly famed, all bear the impress of King's influence and care, and serve as an adequate monument to his energy, patience and skill as a landscape gardener.

In the management of the Cinchona department King's administrative gifts were equally conspicuous. In Northern India it has been found that natural causes render the cultivation of Cinchona unprofitable to private enterprise. But in spite of this fact King so managed the plantations and factory under his control that the Government has been enabled, without incurring pecuniary loss, to place the remedies against malaria which Cinchona bark yields within the reach of the poorest peasant in India.

The extent and gravity of his purely official duties and the care and attention which the reorganisation of the Botanic Gardens and administration of the Cinchona department demanded, did not interfere with the energetic prosecution of purely scientific work, though for many years they left him no leisure for the publication of the results of his studies. But in the midst of his other work he carried out in conformity with a definite plan, the details of which were always wisely subordinated to current exigencies, a survey of the vegetation of the Eastern Himalaya, of the British provinces of Indo-China and of the Malayan Peninsula—thereby taking a considerable share in the task of providing Sir Joseph Hooker with material to aid him in the preparation of the Flora of British India and rendering the Calcutta herbarium commensurate with the needs of so important an establishment, by replacing the rich collection brought together by Roxburgh and Wallich between 1793 and 1828, which had, on the advice of the latter botanist, been taken to Europe and dispersed without leaving a set of the plants in the institution at whose cost and on whose behalf it had been brought together.

It was not until 1887, when the progress which had been made in connection with the Botanic Gardens at Calcutta, and with the factory attached to the Cinchona Plantations in Sikkim, justified King in devoting himself to the task, that he commenced the publication of important contributions to botanical literature. In this year he was enabled, through the liberality of the Government of Bengal, to found the Annals of the Royal Botanic Garden, Calcutta, and he at once proceeded to publish amply illustrated monographs of the difficult and important genera *Ficus*, *Quercus*, *Castanopsis*, *Artocarpus*, *Myristica* and of the families *Magnoliaceae*, *Anonaceae* and *Orchidaceae*. With the exception of that last mentioned, which is of interest largely from the horticultural point of view, these monographs deal with genera mainly composed of trees, many of them being of great economic importance. His

work in connection with the formation of a first-rate herbarium collection, and his experience as a forest officer, led him to realise how frequently competent field workers, whose results in obtaining material for the study of herbaceous plants or shrubs leave nothing to be desired, are deterred by what are no doubt serious difficulties from supplying specimens adequately illustrating arboreous types, and yet how extremely important from the industrial standpoint full and accurate accounts of the constituents of the Indian forests are. By precept and example he strove to remedy this well-known defect, and the accuracy and completeness of these monographs testify to the success which he was able to achieve.

Simultaneously with the preparation of these monographs, King undertook a floristic study of the vegetation of the Malay Peninsula, the results of which were published in contributions to the Journal of the Asiatic Society of Bengal, meant to serve as materials for a flora of the Peninsula, but prepared so carefully that they serve as satisfactory substitutes for a final work.

In 1891 when the botanical officers in the different provinces of India were associated in one department, King was appointed the first Director of the Botanical Survey of India, and in 1895 he was permitted to resign the botanical chair in the Medical College of Bengal in order that he might have more time to devote to his work in connection with the Indian flora.

Of the Malayan materials the first ten parts, amounting to about 1,200 octavo pages, and bringing the task to the middle of the Calyciflorae were issued before King retired from the service of the Indian Government, after thirty-three years' service, in 1898. After his retirement he was compelled, under medical advice, to spend the winter months at San Remo, but his summers were devoted to work at Kew on the continuation of the Malayan Flora. His health was, however, never satisfactory after his return to Europe, and he realised that he might not be able to finish the task he had allotted himself. By an arrangement with his friend Mr. H. N. Ridley, F.R.S., Director of the Botanic Gardens, Singapore, that botanist undertook the elaboration of the Monocotyledons of the Malayan Peninsula, while King continued to work out the remaining Dicotyledons, and after the publication of the thirteenth part, which concludes the Calyciflorae, in 1902, he was was joined by Mr. J. S. Gamble, C.I.E., F.R.S., in the elaboration of the Corolliflorae. For other three years King took his share in the joint work ; since then, partial loss of eyesight and steadily increasing infirmity having led to the enforced abandonment of active participation by King in the work he had so much at heart, the task has been undertaken by Mr. Gamble alone, and the appearance of the twenty-first part, which concludes the Corolliflorae, has coincided almost to a day with King's lamented death. A list of King's contributions to botanical literature will appear in an early number of the *Kew Bulletin*.

King's services to the Indian Empire were not limited to his purely official duties. He was during the greater part of his stay in Bengal one of the most active and trusted of the Fellows of the University of Calcutta, and he served for a term on the syndicate of that institution. He was an original member of the Committee of

Management of the Zoological Garden, Calcutta, the site of which he found a collection of native huts and converted into a beautiful garden. He was a member of the Board of Visitors of the Engineering College of Bengal. in which he took a lively and effective interest. He was for many years one of the Trustees of the Indian Museum, and was at one time the Chairman of that body. He was from 1894, till he retired, the President of the Central Committee appointed by Government to investigate the indigenous drugs of the country.

His skill as a landscape gardener was recognised by the Royal Horticultural Society, who awarded him its Victoria Medal in 1901. His humane services in connection with the manufacture and distribution of the alkaloids of Cinchona bark brought him the honorary membership of the Pharmaceutical Society, the grade of Officer d'Instruction publique, the gift of a ring of honour by the Czar of Russia, and the companionship of the Order of the Indian Empire. His botanical work led to his honorary association with many learned societies and to the award of medals by the University of Upsala and by the Linnean Society. When he retired from India in 1898, a number of his personal friends arranged for the preparation of a medallion portrait which was placed in the Zoological Gardens which he had designed, while a replica was presented to the Botanical Gardens whose beauties he had restored.

His wide and accurate knowledge and the great charm of his manner rendered intercourse with him a highly valued privilege. A wise counsellor and an unfailing friend, his loss is deeply mourned and his memory is treasured by the members of the Kew staff, with whom he was so long and so intimately associated.

The Earl Annesley—We have to record with regret the death of Hugh Annesley, 5th Earl Annesley, which occurred at Castlewellan, Co. Down, on December 15th, 1908. He succeeded his brother in 1874, and was descended from the fourth son of the first Viscount Valentia. In this connection it may be recalled that the famous Arley Castle arboretum, now the property of Robert Woodward, Esq., was planted by the second and last Earl of Mountnorris, the son of the eighth Viscount Valentia who was created Earl of Mountnorris, the title becoming extinct in 1844. Lord Annesley was animated by a sheer love of plants and trees for their own sake with little or no interest in their botanical aspect. At Castlewellan he created, between 1874 and 1908, one of the most extensive collections of ligneous plants in Europe. The domain is a delightful mixture of mountain, water and wood, situated on the sheltered slopes of the Mourne mountains a few miles from the sea and enjoying the climate of the west of Scotland. Here *Myosotidium* produces leaves a foot across and *Lomatia ferruginea* figured in the *Botanical Magazine*, from Castlewellan and seldom seen in cultivation affords a good illustration of its possibilities. A brief notice of Castlewellan appeared in the *Bulletin*, 1906, p. 221, but its charms are well known to lovers of trees through Lord Annesley's interesting book entitled "Beautiful and rare Trees and Shrubs"

published in 1903 and illustrated by numerous photographs from his own hand. He also published numerous notes on his plants from time to time in the Gardeners' Chronicle. In addition to his trees and shrubs he had also a considerable collection of interesting plants under glass.

Shy and reserved, Lord Annesley was never so happy as when he was among his plants. He took little pleasure in London life and was always impatient to get back to Castlewellan. He liked to visit Kew and received a considerable amount of help from it with regard to botanical questions in connection with his book.

He will long be remembered as an excellent landlord of an extensive property and as the creator of a magnificent collection of ligneous plants.

Alteration of walks.—The fence which for fifty years had separated the "Botanical Garden" from the "Pleasure Grounds" or Arboretum was removed in 1895. A path on each side of it had been necessary so long as the two sections of Kew remained distinct, but when the fence was taken down these two walks, where they ran parallel and within a few yards of each other, lost their meaning, except that one was used as a service road for carts, &c. From the landscape point of view, also, this duplication of walks was wrong. During the past winter that section of the service road reaching from near the Victoria gate to the point where it joined the road leading to the Stable Yard has been broken up and will disappear. The path for visitors which went behind the Temple of Bellona and ended at the Unicorn Gate has been brought in front of the Temple, and now ends close to the Victoria Gate. It may be of interest to mention that this path is a portion of the ancient "Stafford Walk," made, so tradition says, by the Staffordshire Militia about 1770. It commenced at the north end of the Rhododendron Dell, passed through the "Hollow-Walk Wood" across the Sion Vista, and ended, as already stated, where the Unicorn Gate now stands.

Berberis Dell.—Kew, in general, is so flat that such diversities of level as it possesses (and they are all of artificial origin) acquire a peculiar value in the landscape. Next to the Lake and the Rhododendron Dell, the most important excavation in the Gardens is the Berberis Dell. Originally it was a pit from which gravel was taken to cover the paths. The idea of developing it into a garden for shrubs was entertained as early as 1869. The depression was considerably enlarged during the next five or six years, and by 1876 it had been brought to its present conformation and planted with trees and shrubs belonging to the early Natural Orders. The species of *Berberis* being the most numerous, it came to be called, perhaps unofficially, the "Berberis Dell." It is one of the most picturesque spots in Kew, the apparent depth of the hollow being increased by its proximity to the mound on whose summit the flagstaff stands—once the site of the Temple of Victory. A new entrance to the Dell has recently been made from the Kew Road

side. The path that runs parallel with the wall is now a very popular walk but access from it to the Dell was previously rather restricted. The new entrance gives an extended view right through the valley in a north westerly direction to the Pagoda Vista and beyond.

Botanical Magazine for February.—The Eastern Himalayan *Alpinia bracteata*, Roxb., is figured from a plant raised from seed communicated by the Royal Botanic Garden, Calcutta, in 1882. It was not, however, till 26 years after, in May, 1908, that its showy but rather fugacious flowers were first produced. These resemble somewhat those of the orchidaceous genus *Phaius*. *Oligobotrya* is a genus of Liliaceae, tribe Polygonateae, which is limited at present to the species figured. This, *O. Henryi*, Baker, is a native of Central China, and has been introduced into cultivation by Messrs. James Veitch & Sons, who furnished the material for the illustration. Besides the typical form, which has white or pale yellow flowers, a new variety (*violacea*, C. H. Wright), in which the outside of the perianth-tube is violet, is figured and described. *Eranthemum Wattii*, Stapf, is an ornamental species from Northern India, which has been introduced by Col. R. H. Beddome. Under the name of *Daedalacanthus parvus*, C. B. Clarke, it has been in cultivation at Kew for about ten years. It is also known as *D. Wattii*, Beddome. Allied to *Eranthemum nervosum*, Roem. & Schultes, it is distinguished by a dwarfer stature, shorter spikes and purple flowers. *Pinus Bungeana*, Zucc., is a distinct species of the 3-leaved section, and is peculiar in that the bark in old trees falls off in white flakes, giving the trunk something of the appearance characteristic of that of the Plane. The cones are small with relatively few scales, which are much thickened at the apex and are shortly reflexed mucronate. The species is a native of Northern China and has long been in cultivation at Kew. *Sorbus (Aucuparia) Vilmorini*, Schneider is an attractive shrub or small tree, with elegant pinnate leaves, terminal corymbs of pretty white flowers, and red globose fruits about $\frac{1}{3}$ in. across. The Kew plant from which the drawing was prepared was presented by Mr. M. L. de Vilmorin, in 1905. It is a native of South-western China.

Mummy-Coffin Wood.—A query has been addressed to Kew as to the wood used for Mummy-Coffins in Eygpt, which was stated by the correspondent to be that of Sycamore. Some pieces of Mummy-Coffin wood were presented to Kew in 1875 by Mr. H. H. Calvert, H.M. Consul at Alexandria, and later, specimens of the wood of *Ficus Sycomorus* were forwarded from Egypt by Dr. Schweinfurth. The microscopic structure of these specimens has been compared in the Laboratory and there is no reason to doubt that the Mummy-Coffins of which we possess specimens were made from the wood of *Ficus Sycomorus*. The following note has been prepared on this subject.

The structure of the two examples of mummy coffin wood, referred to above, is remarkably well preserved. This may perhaps be attributed partly to the natural durability of the wood, but chiefly it is due to the conditions to which it had been subjected. These were no doubt eminently favourable for preservation, since, as Schweinfurth points out*, the air in the Egyptian tombs must have usually remained constantly dry, on account of the climate and the nature of the tombs, the latter being deep rock-built halls, to which practically no external air would penetrate. In the case of the more delicate parts of plants, such as leaves and flowers, the degree of preservation is more surprising, thus, when specimens of this kind are found enclosed in undisturbed coffins, their condition is described as being often equal to that of specimens from old but well-kept herbaria.

The wood of the Sycomore-fig (*Ficus Sycomorus*, L.) is stated to have been very generally used for making mummy-coffins or sarcophagi†. These were either made of boards joined together, or consisted of two pieces—coffin and lid, and, in the case of mummy-shaped coffins, were sometimes multiple structures, two, three, or more coffins fitting one inside the other.

The same wood was largely employed for the carvings of the temples, images of gods, and statues of priests, and also for the manufacture of the most various kinds of furniture, implements and utensils. Another wood used for similar purposes was that of the *Acacia* (*A. Nilotica*, Del.). It is claimed by Woenig that these two trees, in association with the date-palm, were the only two, which grew in groups, and perhaps even formed forests, and that consequently the Egyptians were obliged to depend almost exclusively on them for their supply of wood. The wood of the Sycomore-fig is described as very knotty and hard to work, but at the same time very durable.

The Sycomore-fig appears to have been highly valued by the Egyptians on account of the cool shade given by its dense foliage, as well as for its more practical uses, the stem and branches supplying timber, the twigs being used for burning, and the fruits as food. Medicinal properties were ascribed to different parts of the plant by Pliny‡, who states that the juice of the cortex is an antidote for snake-poison, besides having other curative properties. It is probable that the medicinal use of this plant may have had an early origin in Egypt.

The fruits of this plant have been found among the offerings in tombs, and figure largely in the coloured sculptures, representing offerings, on the walls of the temples. A picture belonging to the fifth dynasty (*i.e.* between 2840 and 2744 B.C. according to Lepsius) represents two men picking the fruits of this species. In

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* G. Schweinfurth, Ueber Pflanzenreste aus altaegyptischen Gräbern, Ber. d. deutsch. bot. Ges., 1884, p. 351.

† F. Woenig, Die Pflanzen im alten Aegypten, Leipzig, 1886. This book, which collects the results of numerous authors (both Egyptologists and Botanists) is the chief source of the following information.

‡ Pliny, Hist. Nat., Harduinus, ed. 2, xxiii., 70 :—"Mora in Aegypto et Cypro sui generis, ut diximus." The footnote to this shows, by comparison with lib. xiii, sect. 14, that *Ficus Sycomorus* is the Egyptian plant referred to.

this and in many other cases the accuracy of the drawing is stated to be quite sufficient for the identification of the tree or fruit. The tree was sacred to Isis, Nephthys and Hathor, and appears to be identified with the "tree of life," beneath which the soul of the departed received the "wreath of justification." A picture of the tree in the Book of the Dead shows two hands projecting from the foliage, and offering food and drink to the wandering soul. Isis and Nephthys were regarded as protectors of the dead, and it was perhaps for that reason that twigs of the Sycomore-fig were sometimes added to the offerings in the tombs.

The tree, which attains a great age, grows wild in Northern Africa (in Egypt, Nubia, Abyssinia, and in oases), where it is also cultivated in gardens, and planted, for the sake of the shade that it gives, by road-sides and in groups near villages.

L. A. B.

Mummy Cloth.—Three samples of mummy cloth have been sent to Kew for examination by Mr. G. D. Morce, Dorset Square, N.W. Two of the samples were of about the date B.C. 900 and the third B.C. 500. Mr. Boodle reported that all the samples appear to have been made from flax. One of the samples was of coarser fibre than the others and had probably been soaked in some greasy or waxy substance.

Pilocarpus racemosus.—The recent note in the *Bulletin* on this subject (*K.B.*, 1908, p. 310) should have contained references to two articles on *P. racemosus* by Mr. E. M. Holmes, F.L.S., Curator of the Museums of the Pharmaceutical Society (*Pharm. Journ.* ser. 4, vol. xvii., 1903, p. 713; vol. xviii., 1904, p. 54). From these it appears that the leaves of *P. racemosus* came on the London market as Guadeloupe Jaborandi in 1903, when they were examined in the laboratory of Messrs. Wright, Layman and Umney, who found only 0·34 per cent. of total alkaloids. As a previous analysis by Dr. D. Rocher, quoted by Holmes, gave 1·0 per cent. of alkaloids, of which three-fifths were pilocarpine, it seemed desirable to have a further analysis; and a sample of the leaves was accordingly submitted to Mr. A. J. Cownley, who found that they yielded 0·6 per cent. of total alkaloids, which gave about 50 per cent. of a crystalline nitrate melting at 155° C. As pure pilocarpine nitrate has a melting point of 178° C., and anhydrous isopilocarpine nitrate a melting point of 159° C., it seemed probable that the nitrate consisted largely of isopilocarpine nitrate. Isopilocarpine is estimated to have only one-eighth to one-tenth of the strength of pilocarpine, physiologically. Further experiments are therefore required to ascertain whether Guadeloupe Jaborandi leaves can be used as a source of pilocarpine nitrate. Holmes suggests, in conclusion, that the discrepancy in the percentages of alkaloids may have been due to the leaves having been collected at different periods of the year.

T. A. S.

West Indian Reports.—From the Imperial Commission of Agriculture for the West Indies the following reports have been recently received:—(1.) Report on the Agricultural and Botanical Department Barbados for the period 1898–1907, with a review of the sugar cane experiments since 1884. (2.) Reports on the Botanic Stations, &c. St. Lucia, 1907–8. (3.) St. Kitts, Nevis, 1907–8. (4.) Antigua, 1907–8. Of these the first mentioned is of particular interest, since it gives a review of the Sugar and Cotton Industries in Barbados since the foundation of the Imperial Department of Agriculture in 1898. The report is illustrated by some good photographs. The history of the Introduction of the Sea Island cotton in 1903 is given and the progress of the industry summarised. In 1902–3 the value of the cotton from the 16 acres grown in Barbados was £318, whilst in 1906–7 the acreage under cotton had risen to 5,000, yielding lint and seed of the total value of £76,376.

An account of the Banana industry, which is also illustrated by excellent photographs is of interest and affords an example of the difficulties which are encountered in endeavouring to establish an industry with an export trade.

In Antigua, in 1907–8, 2,508 acres were under cotton, shewing an increase of 683 acres over the previous year; considerable loss, however, is reported owing to insect pests.

Experiments with Sugar-canes.—Report of the Agricultural work for the season between 1905–7 carried on under the direction of the Imperial Department of Agriculture for the West Indies, Barbados, 1908. Parts i. and ii., Manurial Experiments with Sugar-cane. Part iii., Experiments with varieties of Sugar-cane. By J. P. d'Albuquerque and John R. Bovell.

The work summarized in Part i. of the report deals with the composition of Barbados' rainfall. The weather conditions during the season under review were not altogether favourable to the growth of canes, the rainfall at first being below the average and drought setting in again at a later period. The total amount of rainfall was 76·53 inches, and this supplied approximately 175 pounds of chlorine and 9·5 pounds of nitrogen per acre.

The manurial experiments are dealt with in Part ii. These were conducted at Dodd's Botanic Station and at five other estates on different parts of the island. Both red and black soil areas were represented. The results, set forth in a number of tables, show a substantial increase in crop by the use of either farmyard or artificial manure. With regard to the former, better results were obtained from the application of this substance plus artificial manure than from the use of farmyard manure alone. The effect of phosphatic and potassic manures was variable, but the use of nitrogen after farmyard manure was found both in the case of plant canes and ratoons to yield highly satisfactory results.

Part iii. deals with the important subject of raising new and improved varieties. A very large amount of work has been carried out in this direction, and the results obtained during the season 1905–7 are given in detail in the report.

The characters that determine the value of any variety of cane are arranged in two categories as follows :—

Field Characters :—

1. Germinative power.
2. Behaviour under extremes of dryness and moisture.
3. Habit, upright or recumbent.
4. Power of resisting the attacks of insects and fungi.
5. Period of growth.
6. Productive power in tons of canes.
7. Tonnage of tops.
8. Ratooning power.

Factory Characters :—

1. Milling quality *i.e.* whether the canes are tough or brittle.
2. Fuel-producing property, depending on the percentage of fibre.
3. The relative percentage of expressible juice, determining the "dryness" or "juiciness" of the canes.
4. The richness of the juice.
5. The purity of the juice.

The seedling canes are first subjected to a preliminary field selection, and then to an agricultural and chemical selection which elimates all varieties except those possessing superior qualities. The individuals selected are then used for experimental purposes. During the period under notice, 4,874 seedlings were raised and planted out, making a total of over 32,000 seedlings during the past ten years. Throughout the work the cane that has been used as a standard with which to compare the seedlings was that known as "White Transparent"

The results of the experiments may be regarded as exceedingly satisfactory, a large number of the new canes showing a great improvement in saccharose yield over that of the standard variety. This applies to canes suitable both for red or black soil estates. Full details are given in the tables at the end of the report, whilst other less elaborate tables furnish a summary of the more important results. The success and importance of the experiments will be gathered from the following extract from the covering letter of the Commissioner of Agriculture for the West Indies :—"Table XLVI., giving the mean results of varieties of canes grown on black soils and the average for three and four years arranged according to saccharose yield, shows that White Transparent came out ninetieth with 6,670 lb. of saccharose, whilst the seven best varieties gave over 9,000 lb. of saccharose per acre, and it is now generally recognised that these experiments are proving of great value to the sugar industry of this island. Every year they are receiving more recognition from the planting community, and it is on record that on one estate in British Guiana, more profit has been derived from the cultivation of Barbadoes and British Guiana seedling canes that would cover the cost of the sugar-cane experiments at Barbados, since they were inaugurated in 1884."

Experiments with regard to artificial hybridization are also in progress in Barbados, but up to the present time the varieties thus raised show no indication of giving better results than some of the ordinary seedlings.

A. D. C.

Phalaris commutata.—In the *Agricultural Journal of the Cape of Good Hope*, January, 1909, pp. 26, 27, an account is given of "another new fodder grass — Phalaris commutata," with an illustration of a growing plot of the grass.

This grass has been introduced to the Cape and into Natal from Australia as a drought resisting grass. The plants were raised from seeds sent from Australia which were sown in January, 1908. When about 18 inches high, at the end of April, they were transplanted and the plants were placed 2 feet apart in rows three feet from each other.

In August one of the plants was taken up and placed in one of the driest spots on the farm; but although the spring was a very dry one and the surrounding bush was brown, this plant at the beginning of December was still green and in full ear, standing about 4 feet high.

From another stool which was taken up at the beginning of September and subdivded, 76 plants were obtained; these were planted 18 inches apart, each row being a foot apart. The photograph in the paper shews one of these plots with stems over eight feet high and no thicker than oat straw. Over 150 stalks were found to arise from a single stool.

It is stated that the *Phalaris* stools planted last April are much bigger than *Paspalum* plants, planted three years ago.

The ears appear to get badly broken by the wind and in the photograph the plants are shewn protected by wires to prevent flattening down.

According to the Analysis by the Government Agriculturist, "*Phalaris commutata*" shews the following composition in comparison with other grasses :—

—	Moisture.	Proteins N. × 6·25.	Fat.	Ash.	Total carbohydrates (including fibre).	Fibre.	Fuel value calories per lb.		Nutrient ratio.
							Including fibre.	Excluding fibre.	
Phalaris commutata	13·77	10·37	2·94	14·60	58·32	23·96	1369	973	4·0
Italian grass ...	14·30	9·54	2·91	8·62	64·63	19·48	1427	1073	5·4
Perennial rye grass	14·30	10·29	2·70	8·85	63·91	28·68	1461	939	4·0
Phalaris canariensis	14·15	17·50	2·05	7·47	58·83	40·13	1472	742	1·3
Timothy grass ...	14·30	6·31	1·93	4·29	73·17	28·25	1525	1010	7·8
Kentucky blue grass	14·30	9·75	2·29	5·52	68·14	33·88	1510	993	4·1

An account of this grass is also given in the *Natal Agricultural Journal*, November, 1908, p. 1436, with five interesting plates.

Its drought-resisting properties appear to be very well suited to the dry parts of Natal, and its rate of growth is remarkably quick. One of the illustrations shews a block of the grass 21 days after cutting which had reached a height of 21 inches.

The grass will stand frost, and horses and cattle are said to be very fond of it.

The grass is said to be a native of Southern Italy and other Mediterranean countries.

A difficulty exists as to what this plant "*Phalaris commutata*" of the Australians may be. According to Parlatori (Fl. Ital. I. p. 70) *Phalaris commutata*, R. & S. was described from a mixture of the vegetative parts of *Phalaris nodosa* and the panicle of *P. minor*. Unfortunately there are no specimens of this grass from Australia at Kew so that it is not possible to assign it a definite name. It cannot well be *P. minor*, since this is an annual rarely attaining a height of more than two feet. *P. nodosa* however frequently grows in dry places. Until specimens have been seen, it will be best to refer to this grass as "*P. commutata* of Australia."

According to the *Journal Dep. Agric. W. Australia*, 1907, p. 652, this grass was introduced into Queensland in 1884 by Mr. Harding, Curator of the Toowomba Botanic Gardens, being one of many grasses obtained by him from the Dept. of Agriculture of the United States of America.

Commelina nudiflora.—In July last, a letter was received from British North Borneo, giving information about a creeper which was said to kill the Lalang grass in rubber plantations. Specimens of the weed were enclosed and proved to be the common tropical weed *Commelina nudiflora*, L.

Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, writes that "the plant is an almost useless little weed. It requires rather good soil, nicely turned up, and then it makes a mass of stuff. It cannot grow with Lalang and not at all on the clay ground where Lalang is most troublesome." . . .

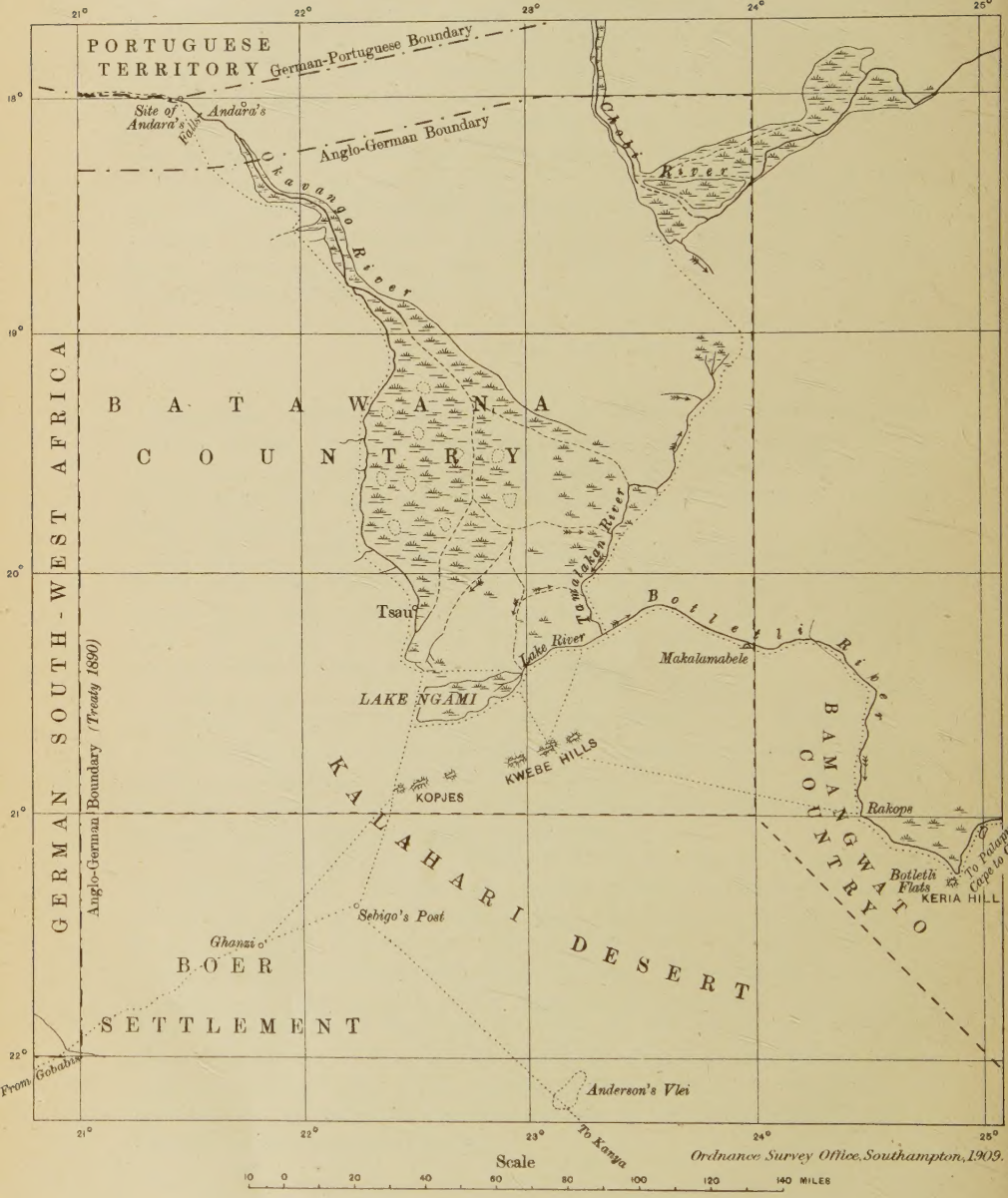
A short note on the plant, by Mr. T. W. Main, in the *Agricultural Bulletin of the Straits* for January, 1909, p. 8, is as follows :—

"It is said to be a splendid plant for destroying Lalang and has been recommended to owners and managers of rubber plantations for this purpose. How such an inobtrusive little plant should have gained such notoriety is quite remarkable.

"The habit and growth of this little creeper makes it quite unfit for such purposes. In the first place, it grows best in damp swampy places, generally in small patches here and there or by the sides of ditches or small streams, and I have never seen it growing on drier Lalang land or in conjunction with Lalang. It is not by any means a robust growing creeper, never rising more than six or eight inches from the ground and does not even possess the property of climbing other vegetation. It is this property of climbing over other plants and smothering them which recommends a plant as an eradicator of Lalang, for example, *Passiflora foetida* is recommended by many because it possesses this habit.

To Face Page 81.

SKETCH MAP OF NGAMILAND



Ordnance Survey Office, Southampton, 1909.